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Impaired Fertility in the Male; Its Importance and Detection.*

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About five years ago, when I was first confronted with a bull of low fertility, I had no idea that the beast in question and his kind would ever be the subject of my remarks to an audience of Scottish veterinarians. I have cursed that animal in the past, but, since, to me at least, this occasion is both a privilege and a pleasure, I now want to thank his memory.

Civilised man is more interested in the general subject of animal reproduction than he realises. His food, clothing, work, recreation and rest are so highly concerned with animal products of some kind or other that the point need not be laboured further. But in addition to the general claim which the subject makes upon us, we are specially involved with the maintenance of animal fertility. Without a large measure of that attribute our profession is doomed. From this view-point impaired fertility becomes to us a matter of fundamental importance. And this, like some other fundamentals, is too often lost to sight on the assumption that *all's well*. Here I wish to sound a note of warning. That assumption is unwarranted: all is not well. And, strange as it may seem on first thought, the fault is not by any means a purely feminine one.

Two examples will illustrate the point. In 1926, Sanders, of Cambridge published a masterly article "On the Fertility of Stallions." It was a statistical study dealing in part with a select class of Thoroughbreds during the years 1889—1924. In the case of these animals it was shown that the trend of fertility was definitely downwards. To quote from the text:—"*the decline has been fairly constant and the mean fertility has fallen, approximately, from* 61 *per cent. to* 50 *per cent., a fall of roughly* 0·3 *per cent. per year.*"

It would doubtless be unreasonable to conclude that in another 150 years the fertility of the Thoroughbred will be *nil* but, in view of the evidence on which it is founded, the statement arrests attention and compels thought.

My second example concerns bulls. Writing of their experiences with these animals in the United States and Canada, Williams and Savage(2) state in part, "The breeding records of 198 of these were known definitely and 34 per cent. of them were poor, Since that time we have studied more than 200 additional cases . . . While insufficient time has elapsed to permit confirmation of all their records, it appears that the proportion of inefficient bulls has not materially changed."

These statements were based on practices confined almost entirely to the diseases of breeding animals. They do not, therefore, apply to herds in general. But the fact that a large number of herd sires suffer from some degree of impaired fertility is one which cannot be permanently overlooked.

Having thus introduced my subject in a general way, I ask your permission to assume the rôle of lecturer. That implies less assumption on my part than on yours—that you may understand my colonial manner of speech—and that you will be charitable enough to listen as though I really knew what I were talking about!

Between the highly fertile sire at one end of the scale and the completely sterile one at the other, there are varying degrees of fertility. All of these intermediaries may be divided into two main classes, *fair* and *bad*. A *fair* sire is one which requires a rather large number of services per living offspring, but whose use does not impair the subsequent fertility of the females to which he is mated. A *bad* one, on the other hand, not only fails to beget a satisfactory number of offspring but, by spreading genital infection, leaves a wake of abortions, cervicitis, endometritis, salpingitis, etc., behind him. He is not only a poor individual performer, but practises a "dog in the manger" policy with regard to his successors. On this basis the *fair* sire is a poor asset: the *bad* one a dangerous liability. Without claiming any altruism whatever, I believe it the duty of practitioners—particularly of those located in breeding districts,—to be able to detect these animals, preferably before they have had much opportunity to do damage.

Unfortunately there is no single and infallible method by which such beasts can be recognised. Indeed, their incrimination often calls for team work between the owner, the practitioner and the pathologist. In certain rare instances the services of a mathematician may be required. But no matter how many technical experts are necessary in order to obtain evidence, the practitioner must remain the team captain, so to speak. He alone is in a position to correlate the various findings and interpret them with sound judgment.

The methods which can be employed are four, namely:—

(1) Establishment of a definite case history.

(2) Demonstration of pathogenic organisms in the genital tract.

(3) Detection of clinically significant lesions.

(4) Discovery of abnormalities in the semen.

These will now be touched upon individually and briefly.

(1) *Case History.*

In order to establish definitely that the fertility of a given sire is declining or not, one must have *full* information about his matings. Theoretically this includes the previous history and clinical conditions of the females to which he has been bred, as well as their subsequent reproductive performance.

In practice one finds some establishments where complete records are available. They are not only very satisfactory, but their rarity makes them a positive delight. My own experience has been that the records kept by most breeders

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are quite inadequate for the purpose and often unreliable as well. In addition, the promiscuous use of a multiplicity of sires often makes it impossible to unmask the truth. Under such circumstances, what can the practitioner do ?

There is only one answer. If a careful study of the animal's breeding history—(taken over a period of time and in groups of five or more matings with females of satisfactory record), either cannot be obtained or shows nothing definite, then ignore it.

In so doing, one should also avoid *prejudice*. This is a difficult frame of mind to cultivate under certain circumstances, particularly when in the employ of an owner who has preconceived ideas and a litigious disposition. And I shall only mention the subject of a previous owner or owners because the shrewd mind can guess its possibilities.

(2) *Demonstration of Pathogenic Organisms.*

I shall not discuss this method at any length. It is for the specialist and the research worker. Suffice to say that, if, by appropriate methods, it can be shown that a stallion or bull is ejaculating dangerous micro-organisms from his genital tract, then one must be guided accordingly. But, as a practical man, I must add to that remark. *At present* I cannot conceive of such organisms being present in the genital tract for any time without producing either clinically detectable lesions or alterations in the semen or both. These changes are dealt with in the next two methods.

(3) *Clinical Lesions.*

Here again I am tempted to be brief in spite of the importance of the subject. For it has been handled so capably by Williams in his volume on "Diseases of the Genital Organs of the Domestic Animals," that it is almost impossible to avoid rank plagiarism. I commend that book to you with the assurance that those interested will find in it that guidance which comes only from thoughtful experience.

Perhaps something should be added about the comparative frequency of the different genital lesions in the male. On this point I have no figures dealing with horses. Excepting a study by Williams, published a year or two ago in the *Cornell Veterinarian*, I do not know where any are to be found.

Last October W. W. Williams and I gave an analysis of 101 clinically diseased bulls. These showed the following :—

Spermatocystitis	67
Epididymitis	12
Atrophy of the testes ...	10
Inflammation of the vas. def.	9
Balanitis (severe)	4
Indurative orchitis ...	2
Prostatitis	2
Testicular abscess	1
	107

Because some of the animals presented more than a single one, the total of the lesions is greater than the number of cases. The outstanding frequency with which the seminal vesicles are inflamed is rather striking. About two-thirds of all our cases have revealed this lesion.

It should be explained that we have only noted those cases of balanitis which were sufficiently severe to prevent copulation. Were all such cases considered, including those of preputial catarrh, I am prepared to believe that they would top the list. In a general way, an ascending infection would than be indicated.

(4) *Abnormalities of Semen.*

So far as I am aware, the study of animals' semen from a clinical point of view was first undertaken about a decade ago by W. W. Williams(3), (4). His earlier contributions to the subject established two facts of practical importance. *First*, that *unsound* semen can often be detected by the use of the microscope—sometimes comparatively easily. *Second*, that bulls which reveal no perceptible clinical lesions may be "spermatically unsound." The latter seems worthy of particular emphasis because, from the breeder's point of view, the value of a sire lies wholly in his semen.

During the past few years it has been my good fortune to collaborate with Dr. Williams(2), (5), (6), and to help in tabulating and classifying the various spermatic defects. Some of our observations will be shown with the aid of the lantern shortly. You will not fail to notice that the various slides illustrate conditions which really concern the pathologist rather than the practitioner. Unfortunately, but few of that calling have shown any interest in the subject to date, though it is conceivable that under the pressure of demand more of them may, of necessity, do so in future.

Meanwhile a word on the subject of preparing slides. Aside from making a thorough clinical examination, this is the most important thing the practitioner has to do. Unless it is well done, the pathologist can be of little assistance. We(6) have made it our practice to use only semen which has been recovered from a female *post coitu*. The external genitals, tail and surrounding parts are first cleaned with soap and water. Excess mucous is then removed from the vagina by hand. Copulation follows. After this as much semen as possible is recovered by hand and placed in a suitable, clean, glass receptacle. The quantity, colour, consistency, odour, etc., can then be noted.

Actual preparation of the smears is now an easy matter. It should be done in a dust-free atmosphere. Half-a-dozen *perfectly clean, dry* microscope slides are laid in a row on a level surface (table top). An ordinary drop of the fluid is placed near the end of one of them and spread into a thin, even film by the aid of another slide held at 45° to it. A solitary stroke under light pressure suffices. The film is then allowed to dry, labelled and packed away in such a manner as will avoid its being scratched. We have recommended making not less than four such preparations for the simple reason that it is not always possible to get one of just the right density for satisfactory work on the first occasion. Most films are apt to be too thick. Their subsequent treatment concerns the laboratory worker. (2), (3), (4).

If one has a portable microscope and desires to examine the living sperm, this is his best opportunity to do so. Frankly, however, I have not given this phase of the subject much study. So far it seems to be rather misleading. Samples which exhibit a high degree of motility in the live

state may show up very poorly when stained. Contrariwise, it is extraordinarily easy—(especially during a Canadian winter) so to chill a good sample that its motility becomes *nil* by the time the instrument is focussed.

(Dr. Savage showed some forty lantern slides to illustrate the types of spermatozoa which he had encountered and considered to be indicative of impaired fertility, or of sterility. Various types of sperm lengths charted on curves were also shown, the significance of lop-sided and skewed curves being explained. Illustrations of these will be found in the various papers quoted in the references given.)

One remark, in conclusion, about the relative efficiency of the methods I have outlined. Three years ago Dr. Williams and I concluded that the clinical examination and the microscope were about equally effective in detecting genitally unsound sires. Since then we have discovered that the biometric method of analysis puts the microscope in the lead(7). But, because the clinical and laboratory findings do not always agree, it is advisable to make the use of both a matter of routine.

Of necessity, these remarks have been somewhat rambling in their nature. Realising their defects, may I hope that your discussion will compensate for the shortcomings of my own ?

References.

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2. Williams, W. W., and Savage, A., 1927. *Cornell Vet.* Vol. 17. p. 374.
3. Williams, W. W., 1920. *Cornell Veterinarian.* Vol. 10. p. 87.
4. Ibid. 1920. *Journ. Amer. Vet. Med. Assoc.* Vol. 11. p. 20.
5. Ibid. and Savage, A., 1925. *Cornell Vet.* Vol. 15. p. 353.
6. Ibid. 1926. *Journ. Amer. Vet. Med. Assoc.* Vol. 21.
7. Savage, Williams and Fowler,1 1927. *Trans. Royal Soc. Canada.* 3rd series. Vo. 31. Sect. 5.

Discussion.

Professor W. M. Mitchell, in opening the discussion, said that the lecture to which they had just listened was, to his mind, one of the most interesting lectures he had heard in that hall. (Applause.) The subject was one which he thought they must confess in this country they had not looked at in the same way as they had across the water. He was not going to try to follow the lecturer into many of the intricate problems with which he had dealt, especially on the mathematical side, but there were one or two observations which he wished to make.

The dangers of venereal disease in the human subject were, he thought, appreciated by all thinking members of the community, though the subleties of the ramifications of such disease were beyond the lay mind. Public education by means of lectures, notices and press articles had done much to bring about such knowledge. Though gonorrhœa, due to the gonococcus, did not affect domesticated animals, yet was the average breeder aware that much of the infertility which occurred among his breeding stock was due to a venereal disease analogous to gonorrhœa in human beings ? The breeder certainly recognised sterility when he could not get a cow to conceive, but whether he realised that the bulk of sterility was due to inflammatory changes of the genital organs following infection was doubtful. He was glad to see that Dr. Savage stressed the importance of the clinician as the captain of the team required to attack the problem of infertility . The idea had got abroad among breeders that research in problems of sterility was one for the geneticist—a person who might take an academic interest in pathology and bacteriology, but who took little or no interest in the everyday field work of the clinician in combating disease.

Though the lecturer had particularly drawn attention to a special side of the problem of sterility—a side to which they in this country had paid little or no attention—he wished to view very generally the problem as a whole. It was the subject of contagious abortion which most exercised the minds of breeders, particularly in the cattle industry, and to a lesser extent the subject of sterility, but the connection between the two conditions appeared to be often lost sight of.

There were two main classes of thought regarding the etiology of contagious abortion in cattle : (*a*) the European School favoured the *B. abortus* (Bang), and (*b*) the American School, led by Professor Williams, which held that there was no such thing as a specific aportion, but that abortion might be due to the various organisms of wound infection. He (Professor Mitchell) favoured an intermediate position, and considered that *B. abortus* was the cause of the storms of contagious abortion which swept through a herd, but, following such an outbreak, secondary organisms gained entrance to the more vulnerable parts of the genital system and were responsible for the marked inflammatory changes met with in these organs for many years after such a storm, and for so much consequent sterility. At the same time, it was quite rational to expect abortion to occur as a result of such secondary infections—infections which in themselves had not prevented conception, but which as pregnancy developed gradually spread—*e.g.*, from an infected cervical canal to the utero-chorionic space, so that in time the vitality of the developing ovum (fœtus and membranes) was threatened and abortion resulted. Were not the abortions occurring in the same cow a second or third time due to such a cause ? When one thought of the repeated efforts of breeders to get such infected cows to conceive—cows in which one often found definite signs of cervicitis or endometritis with varying degrees of purulent discharge from the external uterine opening—it did not seem surprising that bulls should suffer from an ascending infection of their uro-genital system. The statistics which Dr. Savage had quoted of clinical lesions found in bulls were of supreme importance. and he felt sure that if a systematic examination were made of the genital organs of bulls in this country a similar state of affairs would be found.

The latest ascent of the hill of knowledge in the study of genital diseases as affecting the male, at least, was indeed steep, but for those of a mathematical turn of mind the biometric method of assessing sterility must be engrossing. If after further statistical proof by independent workers like results were got as by Savage, Williams and Fowler, then some central laboratory would require to undertake such work. He could not help feeling, however, that clinical evidence of pathological change in the genital organs would always be the chief basis of diminishing the losses from sterility, and microscopic examination of films of semen for gross deformity of spermatozoa and micro-organisms the next most important evidence as far as the male was concerned.

He would like Dr. Savage to confirm the fact, which he remembered seeing in the *Journal of Comparative Pathology and Therapeutics*, volume VII., page 227, 1894, by Eugene Bass, where he stated, " It is important to notice that even in the case of dead or no longer motile spermatozoa one can tell by microscopic examination whether they were dead before they left the testicle or perished after ejaculation of the semen. In the former case the tail of the spermatozoon is rolled in a spiral or shows short bends, whereas in the latter it is straight."

How was this problem of genital disease to be faced ? All conversant with American veterinary literature must

XUM

be impressed with the amount of attention the problem was receiving in America. The intensely interesting lecture they had just heard illustrated that fact. Conferences of veterinarians met to discuss the various aspects of the subject. Veterinary schools had organised or were organising short intensive courses for practitioners which were essentially practical; certain practitioners were wholly engaged in genital practice; a research professorship had been founded in at least one State college for the study of genital disease in animals, and his impression was that they in this country were not yet alive to their responsibilities in guarding the genital health of the breeding stock of these Islands.

As regards the responsibility of the breeder, the breeder allowed himself to be lulled into a condition of *laissez-faire* for months on end in efforts to get his cows to settle to the bull, an occasional success after repeated efforts encouraging him for the time being. His calling accustomed him to disappointments, and it was not until a considerable number of sterile cows were on his hands that he sought advice, and very often by that time the chances of success from treatment were small.

Dr. Savage had alluded to the incompleteness of breeding records of herds in America. The same held good here, and it was essentially on this point that the breeder could assist the team effort which was required to build up the fertility ratio in his herd.

Referring to the responsibility of the profession, Professor Mitchell said that with few exceptions very few of them had really applied their minds to this most intricate problem, though many of them had in a desultory sort of way considered an individual case here and there, and treated it without a clear understanding as to what they were doing. The problem was a herd problem. The salvation of their professional souls lay in education in this subject, and the sooner the under-graduate could be brought into close contact with the subject the better for the whole profession. If the problem could be solved for him he had visions that post-graduate intensive study would soon develop, and the necessary forces would be greatly strengthened to combat such disease.

The subject was one which could not be satisfactorily taught in a large city, and every veterinary college in the British Isles was so situated: the powers that be must sooner or later face this weakness and rectify matters. What had to be aimed at was the training of men who could take over the supervision of herds as far as their genital health was concerned so as to raise the breeding efficiency—another advance in preventive medicine. (Applause.)

The CHAIRMAN intimated at this stage that the discussion was open not only to members of the Association, but also to visitors.

Professor HUTT (Minnesota) stated that all biologists would not agree or assert that there were two distinct sizes of sperms. They said there were two *classes* of sperms, one male-determining and the other female-determining, and some had tried to demonstrate that there was a difference in size, but, as Dr. Savage had said, although several had claimed to find differences in size their findings had not been unanimously accepted by all biologists. (Applause.)

Professor MACKENZIE asked whether Dr. Savage got the correct kind of curve, not lop-sided, and the co-efficient down below four, and yet had a bad bull on his hands.

Dr. DRYERRE (Edinburgh) said that he had listened with interest to what Dr. Savage had told them about the modifications in the sperm heads, and he had been sitting patiently waiting for him to come to the chapter in his story when he thought he might give them an explanation of the variations in the different sperms, because one must look for an explanation with the possibility of trying to effect a cure. He had heard no suggestion from Dr. Savage as to any explanation for those various phenomena which they had seen, but he took it that possibly he had at the back of his mind some explanation or suggestion as to why those malformations came about. Whilst e had been listening to him he had tried to think about any possible explanation that could be legitimately applied, and he would like Dr. Savage to let him know if any investigation had been made into the inorganic constituents of the semen or the concentration of hydrogen ions in the semen. One other minor point was the appearance of the isolated solitary epithelial cell which appeared on one slide. The suggestion had been made that that cell in all probability came from the mucous membrane of the cow. That was quite possible. But there was one he did not mention, and perhaps it had escaped his attention, and that was the possibility of a pathological condition in a bull, whereby it might be suffering from an inflammatory condition of the bladder and this condition would give rise to catarrh. Epithelial cells might appear also under such conditions. He thought that Dr. Savage had given them a great deal of food for thought; it was a problem that quite a number of them were interested in, and it might be greatly to the credit of Dr. Savage if he had initiated perhaps a great deal more concentrated attention on that work in Scotland. (Applause.)

Mr. SNODGRASS said that he had not had a great deal to do with sterility pure and simple during his short sojourn in his practical career, but he had had a little to do with contagious abortion, and he would like to know what the statistics in America revealed from blood tests with regard to the relationship between abortion and sterility.

Principal BRADLEY said that he thought it would be highly ungracious—almost disgraceful—on his part if he did not express his considerable interest in what he had heard of Dr. Savage's address. There was no doubt whatsoever that Dr. Savage's line of investigation was one that was very fascinating, and even those of them who were neither biologists nor mathematicians, and had no special knowledge of or affection for skewed curves, did see that his particular line of investigation was pregnant—and he thought that was an appropriate term (laughter)—with wonderful possibilities in certain directions in the elucidation of sterility problems. He was, however, rather struck with what Professor Mitchell had said. Although he had shown tremendous admiration for Dr. Savage in his work, he (Principal Bradley) gathered that Professor Mitchell leant a great deal more to the clinical aspects of the problems. He did not think one could blame Professor Mitchell for having a leaning in that direction. There was no question, he thought, that the clinician would be called upon to help, and help very materially, in the elucidation of the causes of sterility. How the co-operation of the clinician and the laboratory worker was to be effected could not be stated suddenly and completely, but nebulous notions naturally occurred to one, and among others he thought it was very desirable that there should be some institution of a central character in which the microscopical, surgical and clinical aspects could be studied. In addition, sterility, impaired fertility, and so on, should be studied in the field. That was really the point he wanted to make. As he saw it as an outsider, the study of sterility demanded the closest co-operation between the scientist and the general practitioner, and that probably in a greater degree than any other problem at present confronting the veterinary scientist.

Professor GREIG said that the subject which Dr. Savage had brought before them was really outside his province, and he was afraid he could not contribute anything of a very effective nature to the discussion. He emphatically supported Principal Bradley in the view that there was a dire need for a greater co-operation between the clinician and what they, for the sake of convenience, called the scientist in the investigation of veterinary problems. Apart from the valuable services which had been rendered to clinical medicine by the bacteriologist, there had been so little co-operation in the past in their science between the clinician and the laboratory worker that one did not know where to turn to find the most important and the most pressing problem for solution by such a collaboration. (Applause.)

Mr. JOHN TAYLOR, Edinburgh, said that he had listened with great pleasure to the lecture, which appealed to him

particularly as being one of the inspectors of stallions for the Board of Agriculture. The stallion problem was really a great problem. Owners were paying enormous sums for stallions and getting no progeny. They were responsible for the examination of the testes, and now-a-days they very rarely got defective testes as compared with the early days. He cited one case where £4,000 had been paid for a stallion, and that horse's semen had been examined—he did not know by whom—and he was told it was quite normal. Last season it only gave one foal, whereas previously it had been quite satisfactory. He thought the problem was one which ought to be taken up by veterinary colleges in this country, both from the breeder's point of view and from their own point of view. He thought that any Scottish farmers who owned mares would have enjoyed the lecture very much, and he hoped on his part to be able to broadcast it as much as possible. (Applause.)

Mr. J. R. C. SMITH, Mowhaugh, Kelso, speaking as representing the farming interests, said that he was sorry he had been deprived of the pleasure of hearing the first part of the lecture, but what he had heard had been most interesting. What he sometimes wondered while Dr. Savage was speaking was how actually the farmer was going to benefit unless he owned a stallion or a famous bull. How would a man in his own position, who had probably sixty Cheviot rams to put out on the hill every season, benefit ? One of them, for all they knew, might not leave any lambs, but if his work was faulty it would be taken up by some other sheep on the hill, and the farmer was really left in very great ignorance. Mr. Smith proceeded to give an instance of a sheep with a curious history which he had bought. It was a Border Leicester and it proved a very good breeder. He did not cast a hundred lambs nor anything like it, but he remembered on one occasion there were fourteen sheep sold off him at one sale at an average of £28 a piece, and that at a time when £28 was considered a good price. He was used for two years, and the third year he missed all his ewes. He had said to the shepherd, "Now we have had the use of him to our own advantage, the best thing that we can do with him is to offer him as a gift to the breeder, and if he wishes to try him again, good and well." The breeder did try him again the next year, and he got lambs all right. That was one of the mysteries that he supposed Dr. Savage could explain. (Laughter.) What he wanted to bring out was that in the autumn he would be selling sheep for breeding purposes, and he might have a sheep which he thought a particularly good one, and naturally when the purchasers came to Hawick Fair they would say, "Is he a good lamb getter ?" and he would say, "Yes," but he might fall into the same error as the Border Leicester sheep that he had just referred to. What he wanted to know was, how was he to be able to give a guarantee by investigating under any of the processes that they had been in the habit of using ? He was rather curious to know if you could, when an animal was brought before you, be able to say definitely that it was a satisfactory breeder. (Applause.)

Mr. WALKER, Haddington, referring to Dr. Savage's method of collecting the semen, which was to let the act of copulation take place and then collect it from the genital passages of the female, asked if it was not possible that the reaction in the vagina of the female was responsible for some of the changes which they had seen in the spermatozoa. Possibly he might have taken some precaution to assure himself that that did not take place, and if he did he would like to know what precautions were taken.

Mr. BODDIE, Auchterarder, suggested that if he applied his methods to a bull before the Voronoff operation was performed, and after the Voronoff operation was performed, after a reasonable period, he might be able to obtain, from the data secured, very valuable information as to whether the Voronoff operation was to be of much help. At the last meeting at which it was discussed the results were somewhat conflicting, and it was just possible that by applying Dr. Savage's methods they might come to a conclusion as to the value of such an operation.

Professor MATHESON, Edinburgh, said he wished to ask two questions, one of which was in a sense perhaps on behalf of the general practitioner and the other on behalf of the laboratory worker. With regard to the first, Dr. Savage had said that the material should be collected from the genital passages of the female and slides made as soon as possible. He took it that the material was then allowed to dry on the slides. Dr. Savage had not said anything about the method of fixing. He wanted to know whether Dr. Savage allowed it to dry and then sent it to the laboratory ; or should it be fixed in any way first of all ? With regard to the second question, he inquired what stain or stains Dr. Savage was in the habit of using.

Mr. KERR, Berwick-on-Tweed, inquired whether the bulls were getting the same diet, and if there was any special attention paid to temperature, or any special mineral provided. He particularly wanted to know if they were getting sufficient mineral allowance, and, if possible, the definite amount of it.

Mr. BAILLIE (Cupar, Fife) cited the case of a young Clydesdale stallion, the mares served by which during the first year left a big percentage of foals, while the following season he had been a very poor foal-getter. He inquired whether Dr. Savage had had any experience of that, and if he thought it was due to the animal having been over-used when young, which had adversely affected the semen in later years.

Dr. DRYERRE again emphasised the point that he made about the reaction of the semen and its inorganic content. In some experiments he had been doing recently he and been able to change the reaction of the physiological fluids, and his point was that if Dr. Savage had been able to show that in those defective semens there was an alteration in the reaction measured by the pH. concentration, it might be the cause of the condition, and might be treated practically. He was looking at it from the practical point of view—that it is possible to change the reaction of certain physiological secretions. The question of changing the reaction of semen had not been examined.

The CHAIRMAN, before asking Dr. Savage to reply, said the first thing that struck him very strongly that afternoon was the great frequency of disease in the genital organs. He had no idea that the sperms varied so much or that they were so much affected by disease. If Dr. Savage and his confréres were to go on as they were doing, very soon the students in the veterinary colleges would have to make a special study of the diseases of the spermatozoa. With regard to the question of nutrition, he inquired of Dr. Savage what part nutrition might play in normal healthy spermatozoa, and whether he had ever studied in particular the question of vitamins. He also asked whether it would not be possible to collect the semen in normal saline and send it in—whether you would not get better results than ordinary smears made in the open.

THE REPLY.

Dr. SAVAGE, replying to the discussion, said that Professor Mitchell had brought up the relation of sterility in the male to the whole subject of animal production, and incidentally he had dragged in a pet bugbear of his, namely, the subject of contagious abortion. He did not want to be dragged into a discussion on that subject, but he thought that it might be mentioned in this way. He had assumed, without stating so specifically, that when a perfectly healthy male was mated normally to a perfectly healthy female, live healthy offspring would result. He also assumed that if the female were diseased either before or during pregnancy, catastrophe of some sort might follow. He also assumed that if the male were diseased, the results might be equally disastrous, and he thought that to some extent at least, he might have convinced some of them that this was actually the case. After all, what the breeder was interested in was not the absence of abortion or the absence of sterility, but the production of live offspring, which was the criterion of success. As regards Professor Mitchell's question about live and dead sperms, which dated back to 1894—he was not attempting to pat himself and Dr. Williams on the back—he thought that they had learned a

little bit since 1894. He did not believe it was absolutely possible to tell that any individual sperm was alive or dead at the time of ejaculation. They only knew that the stained result was wrong, and they assumed that the sperm was in that condition at the time of ejaculation.

He accepted Mr. Hutt's rebuke with regard to what he had said about biologists and the different sizes of sperms.

Professor Mackenzie had asked whether it was possible that the biometric method of analysis might be good and still the animal be bad. The answer was *yes*. On more than one occasion he had had good curves from a bad bull, but he had never yet had a bad curve from a good bull. A bad curve invariably condemned a bull ; a good curve did not *necessarily* mean that he was good.

With regard to Dr. Dryerre's first question—why were malformed sperms at fault—his answer was he did not know. He presumed that, looking to the lesions one encountered and clinical inflammation of the various parts, they were the result of infection mostly. He assumed that these groggy sperms were the result of intoxication, but he was not prepared to prove that for the reason that he did not know what was going on in the testes. That was more a matter for the science man. Referring to Dr. Dryerre's remarks about the chemical analysis of semen, Dr. Savage said that he believed Dr. Anderson, of Kentucky, and one or two others in thoroughbred districts in the United States had done some work in that connection, but what their results were he did not know. With regard to the treatment of the beasts to which Dr. Dryerre had referred, unfortunately they had been mainly concerned with recognising the beasts and eliminating them rather than trying to treat them, because clinically what could one do with such things as a testicular abscess ? He knew no clinical method of dealing with those beasts except by eliminating them. If there were any possibility of the successful treatment of such animals he was sure the breeders in possession of them would be very glad indeed to have something tried.

Mr. Snodgrass had inquired about blood tests and sterility. He (Dr. Savage) was not a great believer in blood tests, and neither was Dr. Williams. For that reason they had not had blood tests on more than a very few of the bulls with which they had been dealing, so that he really could not answer the question specifically.

Dr. Bradley had stressed the necessity—and he thought very wisely—for a combination between the field worker and the laboratory worker in the fight against genital diseases. He saw no reason why there should be any friction whatever between the laboratory man and the clinician. In the case of genital diseases he thought there was scope for even more co-operation than in any other disease.

Mr. Taylor had asked about horses. Unfortunately—or perhaps fortunately for himself—he had rather stood away from horses, because this particular kind of work had been initiated by Dr. Williams, senior, and he regarded it as his special province until he had published his results. He was not going to steal Dr. Williams' cannon fodder. Dr. Williams had been studying the breeding of horses for a year or two, and he had furnished Dr. Savage with a number of slides from a great many very famous American thoroughbreds and some others, which had been calibrated fairly well, but until the results were published he did not want to say very much about the subject, except that in a general way the same thing was true as in the case of bulls.

Mr. Smith had asked some extraordinary things about sheep. In the first place, they had not studied sheep as a species of animal at all. He did not believe he had seen a sheep's sperm, but he imagined if the clinician and the microscopist worked hand in hand that it should be possible to determine sexual unsoundness in sheep in the same way as one could determine it in other species. Of course, where one was doing " mass breeding " in the open rather than the individual matings which one practised in the case of high priced cattle, it was quite possible for one beast out of forty or fifty to be quite useless and the breeder to know nothing about it. As to the lapses in fertility that Mr. Smith mentioned, Dr. Williams, junior, had been giving the subject some considerable thought and was still studying it. It was possible for an animal to contract a genital infection without it necessarily being chronic. He might get worse, he might get better, and for a time he might be useless. He had no doubt that everybody present had had experience of a stallion which was highly fertile at the beginning of a season, but which had had an attack of influenza and did very little for the rest of the year.

Mr. Walker had asked a question about the collection of semen. He realised that collecting semen from a female after service in the ordinary way was not ideal, but, so far as he was aware, it was the only practical method. If one took a healthy female, cleaned her, removed excessive mucous, and had her served, he assumed that the material represented a reasonably accurate sample of the male's ejaculate.

Mr. Boddie had asked about the Voronoff operation. His answer was that he did not know.

Professor Mathieson had asked two specific questions about slides and the staining. The suggestion had been made that the practitioner should make the slides and dry them and send them in the dry state. That procedure allowed the laboratory man to know exactly what has been done with them. The process of fixation might be done in a number of ways, but he preferred heat. This made it possible afterwards to dissolve the mucus, whereas if one used alcohol or bichloride this was impossible and the results were not clear.

No staining method was absolutely sztisfactory, but results which were good enough for ordinary work could be obtained by Haidenhain's *Iron-Hæmatoxylin* or by using the eosin and fuchsin combination of Williams.*

With regard to Mr. Kerr's query about diet and minerals, he thought probably he had replied to the question in part already. Dr. Williams, who had had a greater clinical experience, was working on the subject so far as a practitioner could work on the subject. That was to say, he could not take his client's animals and put them under experimental conditions, but he could observe, and his observations would be worth something in time. In his own opinion, minerals were rather being exploited. as vitamins were being exploited in the advertising section of the veterinary press in America. He said " exploited " subject to correction, because he really knew nothing about vitamins, but as a practical clinician he believed that the clinical results, at present, did not justify the amount of advertising propaganda which they were getting from some of the manufacturers of these products.

Mr. Baillie had brought out the question of the Clydesdale stallion with diminishing fertility, and had asked if over-use might account for that. Possibly it might, but he was rather inclined to think that in the course of his season's use that young Clydesdale encountered an infected mare and was suffering accordingly.

Professor Linton had suggested that malnutrition might have a good deal to do with defective spermatozoa. It MIGHT have.

With regard to the possibilities of suspending fresh semen in normal saline, he had not considered it at all. He admitted its possibilities, and it might be very nice, but it always occurred to him if one could get fresh material as ejaculated, and make a slide at once, it probably represented the *status quo* of the animal as closely as one could obtain it under the conditions as they were. (Applause).

" An Evangelical Centaur."

" Why is there no equestrian statue of John Wesley ? " asks the Rev. J. E. Rattenbury in his new book on one whom he describes as " An Evangelical Centaur." " He rode on horseback many thousands of miles over roads dangerous and sometimes, to all appearance, impassable—to preach his message. He read and wrote as he rode, trusting his horse. If he did not, like Francis, speak of ' Brother wolf ' and ' Sister birds,' he surely said ' Brother horse ' to the constant companion of his journeys."

* Williams and Savage. *Cornell Veterinarian*, Vol. 15, p. 353, 1925.

An Introduction to the Study of Poisonous Plants of Kenya.*

By R. W. M. METTAM, M.Sc., M.R.C.V.S.

The study of poisonous plants is at the present time receiving increasing attention at all the agriculture colleges and veterinary laboratories throughout the world, and with every justification, for the number of domestic animals poisoned annually by the ingestion of some toxic plant is relatively very high.

Unfortunately the literature on this subject is very scattered and, with the exception of Lander's well-known text book on "Veterinary Toxicology," there is no compact and up-to-date volume on this important branch of Comparative Pathology. In both the U.S.A. and Australia much work is being done to determine the prevalence of poisonous species of plants, and very valuable assistance is being given by both veterinary and agricultural journals in publishing from time to time lists of plants either known to be poisonous or else only suspected. Pammel[2] says: "I do not know that we realise the damage that poisonous plants do to the livestock industry of the country, but it is enormous." According to Kinsley[17] the annual losses in stock in Colorado and Montana amount to over 200 million dollars. The same statement may be used with equal truth in connection with our knowledge of the poisonous plants of Kenya. At the 5th Pan-African Congress, held in Nairobi in 1924, the various delegates from all parts of Eastern and Central Africa were unanimous in expressing their ignorance of the subject.

In South Africa, Theiler and his co-workers, especially Curson, Mogg, Andrews, Du Toit, Mitchell, Kehoe, Henning and others, realised at a very early date the necessity of carefully examining the veld for poisonous plants during the investigation of any new or unknown fatal disease. These pathologists were able to incriminate many plants, and as time passes their work is being largely substantiated and extended. Thus Henning, in 1926, proved conclusively the toxicity of *Cotyledon ventricosa*, which, however, both Soga and Weyer[4] more than suspected of being capable of poisoning stock as far back as 1891.

My intention in this paper is to describe very briefly with the aid of diagrams and actual specimens some of the more common diseases of the domestic animals caused by plant toxins.

The specimens passed around for inspection were largely collected in South Africa, and I wish to take this opportunity of thanking both Dr. Curson and Mr. Mogg, of Pretoria, for their kindness in helping me to make a representative collection of the main botanical families in a short space of time.

The list of poisonous plants is a very formidable one, and in choosing certain species for to-day's lecture I have been guided by the knowledge that either these identical species or very closely allied ones exist in Kenya and not very far from headquarters. Many of the plants described by Theiler and others in South Africa actually exist in this country, in large quantities, so that it is only a question of time before we shall meet cases of plant poisoning whose symptoms and pathology have already been carefully elucidated. It behoves us all, therefore, to be on the constant watch.

It has been frequently asked, and with reason, whether the African native, particularly the pastoral races such as the Masai, know anything of plants injurious for stock. The answer seems to be that the native generally, while often ignorant of the native name of the plant, knows what plants are harmful, and the herd-boys are careful to see that such plants or trees are not eaten by their stock. Many tribes, such as the Akamba and Dorobo of this Colony, the Pigmies of the Congo, and the Bushmen of South and South-West Africa, have a considerable knowledge of trees, shrubs, etc., suitable for the preparation of arrow poisons, many of which are still unkown to white science, and the preparations of many of these poisons are jealously kept secret. We do know that a decoction of the twigs and leaves of both *Acokanthera schimperi* and *Acokanthera longiflora* (Apocyanaceæ), especially the former, are used by the Akamba and Dorobo to anoint the tips of their spears and arrows. Quite recently a branch of the latter tree, without flowers and fruit, was sent to the laboratory for feeding tests, as a farmer suspected it of having poisoned some of his stock. The test caused an acute diarrhœa in a bovine, but the animal recovered. Further experiments and information have shown the toxicity of the genera, but the one quoted above is interesting in that a tree which is used for the preparation of a powerful arrow poison many only produce temporary gastro-intestinal disturbances when a decoction of it is given *per os*. It is well known, however, that poisons which are rapidly fatal when introduced into the circulation through a skin wound often fail to set up symptoms when taken into the alimentary canal. This is very well illustrated by various snake venoms and arrow poisons.

Distribution of Poisonous Plants.

This depends on a variety of conditions, such as climate, nature of soil, latitude, cultivation and other factors, some of which are not definitely understood. Many plants, including the common grasses, are only poisonous under certain conditions. These will be discussed later.

It may be laid down definitely that poisonous plants are most abundant in tropical and sub-tropical climates, in rocky or arid places, and in deserts. In Kenya, therefore, one would expect to find that the Highlands, where white civilisation is largely settled, contain fewer and less virulently poisonous plants than the coastal area, or the Nyanza basin, or the great desert or semi-arid regions to the north of Mount Kenya, and the Northern Frontier, or the Taru desert below Voi, amongst others the great families Leguminosiæ, Apocyanaceæ, Asclepiadaceæ, Euphorbiaceæ, etc., predominate.

Lander[1] has stated that "civilisation leads to a diminution in the generation of poison by a plant," and "when the preservation of a species is assured, there is no need to elaborate poison," and he quotes what many practising veterinarians know well—how often cattle and horses eat with impunity cultivated plants such as yew, aconitem, rhododendron, etc., which are definitely toxic when wild, and eaten by stock.

Animals do not readily eat poisonous plants, and various reasons have been advanced to explain how they know what to eat and what to avoid when they are at pasture. Instinct and selective feeding are two common explanations generally put forward, but sudden change of pasture, as when cattle are introduced from one part of the country to another where the vegetation is different, frequently leads to poisoning, as the animal, unfamiliar with the new veld, eats much that it does not know. Generally, however, animals at pasture are careful feeders for, even in times when the grass is low, noxious weeds and poisonous plants are found to be left severely alone. The theory has been advanced by a few observant farmers that some animals, especially young animals, are like children, in that they are attracted by the colour and appearance of an unfamiliar plant and eat it, often perhaps with fatal consequences.

Another method of poisoning is by the ingestion of plants cut with hay or lucerne and fed to the animals while stabled. This might well occur in cases of plants that thrive in pasture lands such as crotolaria, and even senecio, which frequently grow near irrigation furrows and trenches.

It would be interesting to know if the wild herbivora so plentiful in Africa ever succumb to plant poisoning. Probably in their case selective feeding is reduced to a fine art and, moreover, they seldom change the type of veld to which they are accustomed.

Plants are more poisonous in early spring and in the autumn. Very often in places where the veld has been burnt, there appear after the first rains several poisonous

* Paper presented at a meeting of the Kenya Veterinary Medical Association held at the Veterinary Research Laboratory, Kabete, Kenya Colony, on 3rd January, 1928.

members of the family Iridaceæ called popularly "tulp." Tulp poisoning is very serious and prevalent in South Africa. It is said to occur in the Rift Valley on the shores of Lake Naivasha, Lake Nakuru, etc. It will be interesting to hear the opinion of the Field Veterinary Officer at Gilgil on this statement. The plants causing tulp poisoning will be mentioned later.

All parts of the plant may be equally poisonous, some part or parts may be less poisonous than others, while the plants may be only poisonous under certain climatic conditions—drought, sun, and wind after rain, etc. Swanson, quoted by Henrici[5,6], showed that sorghum and andropogon produce hydrocyanic acid on wilting, and cattle and horses fed on these grasses became ill, especially cattle. Henrici was able to detect hydrocyanic acid in aqueous solutions of wilted grasses by its characteristic odour. She also makes the following valuable observations which may be quoted in full: "As a general rule it was found that none of the grasses (examined) while fresh yielded any hydrocyanic acid, but that practically all did so under certain conditions. One of the conditions is wilting or at least incipient drying, in spring. It is peculiar that hydrocyanic acid (*i.e.*, its compounds) occurs more frequently and more abundantly before the rains in spring, or after the rains if conditions are such as to cause wilting of the plants, than it does during the summer drought periods. Many of the grasses used by Henrici in her experiments are commonly found throughout East Africa, and it is extremely likely that they possess cyanogenetic substances readily converted into hydrocyanic acid (*i.e.*, its compounds) as do the same grasses under very similar climatic conditions in Bechuanaland.

It is noteworthy that wilted grasses swollen out by the rains lost their cyanogenetic substances within a few hours. Henrici also noticed that grasses that contained little or no cyanogenetic substances have a reddish purple colour during drought periods, in distinction to grasses which do contain cyanogenetic substances and not show those colours. This colour index of identifying grasses not containing cyanogenetic substances from those with cyanogenetic substances may be very useful in the examination of suspected poisonous veld in times of drought, for as in Bechuanaland and in the arid regions of America, poisoning of cattle and sheep by those compounds must invariably occur in Kenya in the long dry period before the short spring rains. It must be remembered, however, that many edible plant leaves contain compounds of hydrocyanic acid, and apparently do not hurt cattle. Henrici remarks on this by suggesting that the amount of hydrocyanic acid in these plants is insufficient to produce visible effects.

Curson was the first to suspect the toxicity of the Dimorphotheca species (family—Compositæ) which contain cyanogenetic glucosides. Under the influence of a hot sun and a drying wind these plants became wilted and are, because of the high cyanogenetic content of the leaves, etc., very poisonous for sheep. Under normal conditions, however, it may be very difficult to prove these plants poisonous.

It must be remembered that many plants are merely harmful. These must be distinguished from poisonous plants. Such are the common blackjack (*Bidens pilosa*—Compositæ) which is found in great profusion on waste lands and waysides. The barbed black seeds may cause superficial ulcerative lesions of the buccal mucosa and matting of the wool. The thorned fruits of *Tribulus terrestris* often cause wounds of the feet of sheep and even their lips when the animals are searching on the veld for food, while the barbed grass *Aristida congesta*, a common Kenya species, is responsible for similar lesions. As is well known to all, many plants taint the flesh or milk, and these must be recognised and avoided by the progressive farmer.

The toxicological history of another plant may be described fairly fully, because it is very poisonous at certain seasons. I refer to the prostrate herb *Tribulus terrestris*, which is common on sandy soil in the warm parts of this country.

This plant is the cause of geeldikkop in sheep, a disease in which there is much œdematous infiltration of the subcutaneous tissues of the head. Theiler found that the plant was only toxic in the flowering stage, while it is growing luxuriantly, and before the seeds begin to mature during the hot weather after the rains. Plants fed at other stages of its life history failed to reproduce the disease under experimental conditions. Whether Tribulus is poisonous for stock in Kenya is at present unknown, and it is also impossible to state if it is only poisonous under conditions similar to those described by Theiler in South Africa. The really important point is that we have in this country a plant of proved toxicity for sheep, and we must be on the look-out for it.

Sometimes apparently harmless plants may cause poisoning. The explanation is that many of the graminæ become infected with disease and may be highly toxic when ingested. Thus Mitchell[7] has shown that cattle fed on either (*a*) maize infected with *Diplodia zea* or (*b*) a common grass—*Faspalum dilatum*—infected with a species of ergot, *Claviceps paspali*, may develop serious symptoms and even die. The symptoms of the former condition were inco-ordination and paralysis. It is noteworthy that death only occured in the animal which was fed with infected material after the onset of symptoms. No treatment was tried in the other cases which recovered spontaneously. Cattle affected with *Claviceps paspali* showed symptoms of hyperæsthesia and inco-ordination. Pregnant cows did not abort. Recovery is the rule, but slow, and not hastened by medicinal treatment.

Poisoning by algæ, fungi and minerals will not be noticed in this paper.

Very little systematic work has been done on the flora of Kenya, but considerable progress has been made in the study of trees by the Forestry Department, with the result that a catalogue of the more common trees and woody plants has been published by Battiscombe[8], but this, while a very useful handbook, is obviously inadequate for the veterinarian and farmer who wish to recognise the common plants both known and suspected to be poisonous. Wherever possible Battiscombe notes whether a particular plant is poisonous or simply suspected or a useful fodder article. With one or two exceptions, which will be quoted later, our knowledge is derived from South African publications. It is very important that both Kenya and South Africa should know what poisonous plants exist in either country, as Bowa has shown that there is a definite relationship between the flora of Tropical and Southern Africa.

Before concluding these preliminary remarks it is wished to indicate the scope of this paper. Any discussion dealing with the classification of poisonous plants or with their pharmacological properties will be curtailed, as it is believed that a description of the following genera will prove most beneficial as they are foremost among the important poisonous plants, and some of these are very toxic, *viz.*, Crotolaria, the "tulps," Acokantheria species, and the various plants called "slangkop." At the end of the paper there is presented a brief list of plants of proved toxicity with the symptoms they cause, and of plants used for various medicinal purposes. It is quite possible that some of the latter may, after further pharmacological tests, prove of benefit for the use of medical science in general.

Poisoning by Acokanthera (Acokantherosis).

Plants responsible: *A. schimperi and A. longiflora.*
Family: *Apocynaceæ.*

Curson has described very fully acokantherosis, and reference may suitably be made to his paper. He describes the symptoms of poisoning by *A. venenata*, but mentions *A. spectabilis* and *A. schimperi*. Both the latter, as well as *A. longiflora*, occur very commonly in this Colony, but in this paper Acokantherosis due to *A. schimperi* and *A. longiflora* only will be noticed.

Plants belonging to the Apocynaceous family are mainly tropical in distribution, and in Kenya are more common in the coastal region and Nyanza basin than in

the highlands. A very noticeable feature of the family is the abundant latex, which in many members is very poisonous. The latex of some of the Landolphia is collected and used as rubber, especially of the *L. kirkii*, while the shrub *Strophanthus verrucosus*, is of considerable medicinal value.

Description of A. schimperi and A. longiflora.

Both are small much-branched trees, 15—25 feet high, with spreading crown and olive green, shining, simple ovate leaves, which vary in length in the two species. In *A. longiflora* the leaves are 2—3 inches long and opposite, and in *A. schimperi* 2—4 inches long. The flowers are small, white, heavily scented, and superficially resemble English jasmine in appearance and odour. The flowers are arrayed in dense clusters at the axis of the leaves, and are followed by small fruits 1—3 inches long, which look like small plums, olives, or damsons. The fruits of both trees are edible, and the Masai say that the ripe fruit of *A. schimperi* is much relished by elephants.

Both trees are common round Nairobi, in the Ngong Forest Masai Reserve, and in the drier parts of the country. They are easily recognised and have the following vernacular names :—

	A. schimperi.	*A. longiflora.*
Masai	Ol. morigye	—
Kamba	Kibai	Kibaichiago
Kikuyu	Murichu	Mururu.

A decoction of either *A. schimperi* or *A. longiflora*, and generally the former, as it is more potent, but often a mixture of the two, is employed as the basis of the famous Kamba arrow poison.

It is interesting to know that, according to Smith,[4a], the Bushmen obtained their poison by treating the powdered wood, but the Akamba and Akikuyu use a tarry decoction of leaves and twigs *plus* the sticky juice of the leaves of the common wild cactus. The exact preparation of this deadly arrow poison is kept secret.

Cases of Acokantherosis in practice.

As noticed in South Africa[4], acokantherosis chiefly occurs in the dry season when the veld is poor or low in condition. The attractive greenness of these trees is a sore temptation for half-starved cattle, which eat the leaves without heed of their surpassing bitterness. At present it is not known how prevalent acokantherosis is in Kenya, but recently a farmer near Nairobi suffered serious mortality. The ubiquitous distribution of the trees may indicate that acokantherosis is fairly common before the short rains.

Symptoms of Natural Cases of Acokantherosis.

Unfortunately, no natural cases were seen by the writer, but the symptoms were briefly noted by the farmer. There were chronic muscular spasms, convulsions, profuse salivation, marked rolling of the eyeballs, and inability to rise. At first there was constipation, but soon followed by fœtid diarrhœa. Cases lasted from 1—3 days, according to the severity of the symptoms, but it is conjectured that there were some very acute cases which succumbed rapidly. There was no opportunity of examining the vascular system clinically. Pieces of the two acokanthera trees described in this paper were recovered from the rumen and stomach of the dead cattle. The native herdman was positive that the cattle in question died from acokantherosis.

Post-mortems made by the farmer showed acute gastro-enteritis. Treatment was of no avail.

Experimental Investigations.

Pieces of the suspected trees were botanically examined and found to belong to the family Apocyanaceæ ; specimens in flower and fruit were obtained and shown to the natives, who unanimously declared the flowers, the young green twigs and stems to be poisonous. The fruits are non-poisonous and, though bitter, are readily eaten raw by the natives, and either boiled or in the form of jam by Europeans. As already noted, the fruit of *A. schimperi* are said by the Masai to be much relished by elephants.

An infusion was made from both *A. schimperi* and *A. longiflora*, and given to sheep and goats as follows : (*a*) subcutaneously, (*b*) intravenously, and (*c*) *per os* in a drench.

Four sheep inoculated either intraveously or subcutaneously with the infusion failed to die, but were gravely ill for a period of several days.

Four sheep and one goat drenched with an infusion of *A. longiflora* or of *A. schimperi*, or of a mixed infusion of the two trees, died rapidly from acute poisoning in times varying from 17 minutes to 21 hours. The poison was administered by stomach tube to animals starved from 1—3 days. In no case could an animal be induced to eat the fresh leaves or twigs. One goat casually ate a few small leaves, but soon rejected them after swallowing one bolus.

It appears very remarkable that two trees regarded as producing a most deadly arrow poison should fail to kill sheep and goats after inoculation of an infusion subcutaneously and intravenously. The manufacture of the arrow poison from those Apocyanaceous trees is a native secret. Probably the poison obtained from the Acokanthera is a compound one, as it is known that to the Acokanthera decoction the juice of the leaves of the ordinary wild cactus is added. The rapidity with which the infusions killed in drenching shows that this particular vegetable alkaloid—Acokantherin, must be one of the most rapidly fatal poisons known.

Symptoms of Experimental Cases.

Symptoms appeared within ten minutes of dosing or inoculation. The animal was uneasy, salivated freely, and chopped his jaws, and continually shifted his position. Urination and defæcation were frequent.

The above symptoms were often not marked, but if the animal died within a short time of drenching they were much exaggerated, and, moreover, the respirations were very hurried, often 100 and more. In cases of rapid poisoning the animals grunted and frequently moaned, then staggered and fell. Death occurred 2—3 minutes after falling.

In less rapidly acute cases the above symptoms were noticed but were more mild. Salivation, chopping of the jaws, swallowing movements, increased respirations, diuresis, great thirst and continual uneasiness and anxiety were observed. Grinding of the teeth was heard in animals that survived overnight, while diarrhœa did not supervene until after the 10th or 12th hour following drenching. The diarrhœa was very fœtid, olive green in colour, pultaceous, but never dysenteric. In all hyper-acute and acute cases, the pupils were widely dilated and there was a constant expression of fear and anxiety. Death was preceded by no prolonged decubitus or agony ; the animal simply staggered and fell, and became comatose. There was complete anorexia, but the animals showed a great thirst and would continually sip at water or drink large quantities if the bucket was put in the stable after being withheld for any length of time.

The symptoms of animals inoculated intravenously or subcutaneously were materially the same as those described above, but far less acute. The animal would drink freely but refuse dry food for days, only nibbling at grass in a half-hearted manner. Diarrhœa (fœtid and green) and diuresis were noticed, and loss of condition was very rapid.

Those that recovered experienced a long convalescence, the diarrhœa continuing fœtid for a week or ten days.

In no case were any clinical observations made on the heart and pulse.

Pathological Lesions in Experimental Cases.

These may be briefly summarised, *viz.* : (*a*) acute congestion or, in prolonged cases, acute gastro-enteritis ; (*b*) anæmia and acute œdema of the lungs ; and (*c*) systolic heart. There was a well-marked cyanosis of the visible mucosæ.

The gastro-intestinal lesions were very noticeable. The fundus of the stomach, the duodenum and small intestine generally and the cæcum were always affected.

XUM

The mucosa was very swollen, and a deep blood-claret colour. No ulceration was observed. When the inflammation was less acute the mucosa was studded with roundish pin-head hæmorrhages. In the very acute cases of poisoning the mucosa was a deep rose colour, but the best changes were found in the cases that survived for 20 hours or so.

In every case the heart was very firmly and noticeably contracted, so that the cavities appeared much smaller than normally. The blood was very dark, tarry and liquid. It stained very well.

The pulmonary changes were very characteristic. In all cases the lungs were much distended with air, pale pink in colour, and very doughy in consistence. There were well-marked impressions caused by the overlying ribs, and if the lungs were manipulated the fingers made deep and permanent impressions on the organs.

Sections showed the lungs to be poor in blood, very moist and doughy. A fine liquid oozed from the surface of the sliced lungs when squeezed. Emphysema was present in a few cases, but in a mild form.

No other constant lesions were found in the remaining organs. Unfortunately there was no opportunity to autopsy a natural case, but the farmer assured me that acute enteric lesions were present.

Treatment was not tried.

Discussion.

In his paper Curson[4] gives the following list of diseases with which acokantherosis may be confused, *viz.*: (*a*) anthrax; (*b*) heartwater; (*c*) redwater; and (*d*) acute arsenical poisoning. He also included lamsiekte, but as far as we know this disease does not occur in Kenya and need not concern us here. All the above-mentioned diseases occur more or less commonly in this Colony, and they have much in common, both as regards symptomatology and pathology, with acokantherosis.

Two of them, *i.e.*, anthrax and redwater, may be diagnosed microscopically, and arsenical poisoning may be proved by chemical analysis, but it may be quite possible that many of the so-called cases of heartwater, especially those that are not reproduced in experimental and susceptible cattle in the laboratory from blood submitted by the farmer, may be due to poisoning by plants belonging to the acokantherosis species. Curson has noted that both acokantherosis and heartwater occur in the same kind of country, and it might be possible to differentiate between the two conditions by examining the stomach contents for the typical leaves of the acokanthera. Of course blood inoculations into susceptible animals should allow, in most cases, of a definite diagnosis of heartwater, but it is well to remember that there is a very close resemblance between the two diseases.

Summary and Conclusions.

(*a*) *A. schimperi* and *A. longiflora* are common trees in Kenya. In times of drought they may be eaten by cattle, sheep and goats with fatal results.

(*b*) Experimentally, drenching four sheep and one goat with an infusion of these trees resulted in a mortality of 100 per cent.

(*c*) The symptoms are very acute and are manifested by an acute gastro-enteritis, great prostration, cyanosis and death. Sometimes nervous symptoms are said to occur in natural cases in cattle.

(*d*) Pathological examination of experimental cases showed a very acute inflammation of the stomach and intestines, acute œdema of the lungs and marked systole of the heart.

(*e*) A differential diagnosis is necessary in order to distinguish acokantherosis from other common Kenya diseases, *e.g.*, heartwater, anthrax, arsenical poisoning and even redwater. The ubiquitous distribution of acokanthera in Kenya leads to the conclusion that acokantherosis may not be an uncommon condition.

Tulp Poisoning.

"Tulp" is the South African Dutch name for tulip, and is rather indiscriminately used to designate certain members of the family "Iridaceæ." Botanically the "tulps" belong to two genera, *viz.*: (*a*) Homeria and (*b*) Moreæ. Both have a very wide distribution throughout Africa and belong to a family common in the tropics.

That the tulps occur in Kenya is well known, but it is still uncertain if tulp poisoning really occurs locally, although, as has already been said in this paper, it has been recognised as occurring on the shores of Lake Navasha by a layman who knew the disease in South Africa.

Both Moreæ and Homeria grow best in marshy lands and along river banks, streams and water courses. They appear in early spring when the veld is in low condition, when their fresh greenness is a fatal lure for semi-starved cattle.

Botanical Features.

There is a certain resemblance to the common tulip, which is a typical member of the family Iridaceæ. The plants vary in height from 1—2 feet. The Transvaal yellow tulp *Homeria pallida*, has a whitish bulb, a single leaf produced from the base of the stem, long, rigid and ribbed. The stem is about one foot high and bears clusters of flowers on the upper half, each cluster enveloped by lightly-rolled finely-ribbed sheaths." Superficially other Homeria resemble the above description, but the flower varies in colour, *e.g.*, red.

The Moreæ resemble the garden iris in the shape of their flower, but evince a great variety of colours, such as blue, purple mauve, yellow and red.

All the tulps are not poisonous, but the wise precaution exists in South Africa of regarding all these plants as probably toxic for cattle, and therefore to be avoided. The same precaution should be exercised in this Colony when tulp-like plants are found growing wild on a farm.

Symptoms of Tulp Poisoning.

Tulps are generally eaten in the early spring, but cases have occurred from the ingestion of hay or lucerne containing the plants. The toxicity of these herbs may be gathered from the amount required to cause poisoning. According to Stent[9] 4—8 ounces have been known to kill oxen.

The common symptoms of tulp poisoning are prostration, abdominal pain and profuse diarrhœa. All these symptoms become increasingly marked, and the diarrhœa often becomes bloody, and full of shreds of mucus. Urination is frequent and in small amounts, while tympany may be very acute.

In many cases there is lacrimation, suffusion of the eyelids, and a sunken appearance of the eyeballs. Nervous symptoms are generally noticed, *e.g.*, dulness, drowsiness, and stertorous breathing. Finally, the animal becomes very weak, staggers and collapses, death soon intervening.

Most of the above symptoms are found in acute cases of rinderpest, and it may not be very astonishing if cases of tulp poisoning have already occurred in Kenya, and been diagnosed as cattle plague.

The two may be further confused by reference to the temperature. In tulp poisoning it may be 104° or more, but there is generally hypopyrexia before death, due to marked relaxation of the anal sphincter. Ulceration of the buccal mucosa, to many pathognomonic of rinderpest, does not occur in tulp poisoning, and this, when present, may serve to distinguish the two conditions and further, of course, the infectiousness of the cattle plague would not allow of any confusion. But it is well to remember that, as regards the symptomatology, the two diseases have much in common.

Post-mortem Appearances.

The intensity of the gastro-intestinal lesions varies from a slight rosy flush of the mucosa to a well-marked acute congestion. The lesions are best evinced in the abomasum, small intestine and cæcum. No ulceration is noticed, and this ought to serve as a differentiating feature between tulp poisoning and rinderpest. There are no other constant or typical lesions.

The external appearance of a carcase may have a close resemblance to a dead rinderpest beast—the marked

soiling of the hindquarters and perineal regions, the dilated and everted anus, and the lacrimation and sunken eyeballs, but these are by no means specific for rinderpest and tulp poisoning. They occur in many other acute febrile diseases.

Treatment.

There is no specific. Before scouring becomes too severe give a purgative and, for preference, one that acts rapidly, *e.g.*, eserine. Once the diarrhœa has set in demulcents and sedatives are indicated to allay the intestinal irritation, while stimulants may be ordered if there is marked nervous depression.

If recovery occurs convalescence is slow, as the animal is very thin and weak. Good easily digested food is, therefore, indicated.

Remarks and Conclusions.

The similarity between a clinical case of rinderpest and tulp poisoning has been described. There are differentiating features between the two conditions, but it is considered very probable that cases of tulp poisoning have occurred in this Colony and not been diagnosed.

The severity of tulp poisoning varies greatly. Death may occur in a few hours or only after three or four days. If the animal has had access to water death is hastened, as the absorption of the poison from the bowel is greatly accelerated. Relapses are not unknown—an animal dying after appearing convalescent.

Both the Homeria and the Moreæ that have been proved toxic produce more or less the same symptoms. Very little is known concerning the toxic principles of the various tulps or of the different parts of the plants. The bulbs are said to be less harmful than the leaves, stem or fruit, as they are often eaten by pigs. As in the case of other plants it is quite feasible that the toxicity of the tulp depends on climatic, telluric and geographic conditions not yet understood.

Slangkop Poisoning.

Family: *Liliaceæ.*

Slangkop is a rather loose South African term meaning snake's head, and is generally given to liliaceous plants which have a long upright stem at the end of which are the flowers whose weight causes the stem to curve somewhat. The result is to simulate the appearance of a snake with its head raised and neck curved as in an attitude of striking.

At present three distinct plants have been blamed for slangkop poisoning, and as each plant is found numerously in different provinces of South Africa, they are designated Natal, Cape, and Transvaal slangkop respectively. All belong to the family Liliaceæ.

Transvaal slangkop is ***Urginea Burkei, Bkr.***, and Natal slangkop is ***Urginea macrocentra, Bkr.***, but as there appears to be some doubt if the Cape slangkop is really poisonous it will not be further mentioned in this paper.

CLINICAL AND CASE REPORTS.

Milk containing Tubercle and Diphtheria Bacilli.

By J. Howard Jones, O.B.E., M.R.C.V.S., County Veterinary Inspector, Glamorgan.

I beg to be allowed to quote the remarkable coincidence of a series of cases of diphtheria from and infection with tuberculosis occurring in the milk retailed in a city, but which milk was produced at a farm situated in the county adjoining, together with the results of investigations carried out. I will endeavour to place the occurrences in sequence of dates.

On August 10th, in the course of routine sampling, this milk was sampled at the retailer's for the purpose of examination for the presence of tubercle bacilli, upon biological investigation by the health authority of the consuming city.

Between 21st-27th September seven cases of diphtheria occurred in the city, and all cases were being supplied with this particular milk by the retailer. Examination of all persons handling this milk was made, the daughter of the producing farm being found to be a "diphtheria carrier." Upon her being isolated, no further cases occurred.

On the evening of 26th September the producing farmer informed the County Veterinary Inspector that he had a cow in his possession that he suspected of being tuberculous. The veterinary inspector visited the farm the next morning, examined the reported cow, and found that she was suffering from tuberculosis of the udder and lungs, arranging for slaughter on the morrow (28th). Examining other cows on that farm, it was noticed that numerous animals were suffering from ulcerations of the teats and information was volunteered that they were all under treatment for "cow-pox."

Upon the inspector's arrival home (evening of 27th September) he was informed that the sample of milk taken on August 10th had now proved to contain tubercle bacilli, and he was asked to make the necessary examination of the producing herd.

Slaughter of the cow was carried out on the following day and *post-mortem* examination verified the diagnosis. Subsequently, as per Milk and Dairies (Consolidation) Act, 1915, further examination of all cows on the farm was

BIBLIOGRAPHY.

	Publication.	*Author.*	*Reference.*
[1]	Veterinary Toxicology	G. D. Lander	London.
[2]	Some Poisonous Plants of California	L. H. Pammel	*Vet. Med.*, May '26.
[4]	Some little-known South African Poisonous Plants and their effects on Stock...	H. H. Curson	
[4a]	Quoted by Curson. *Vide supra.*		
[5]	Preliminary Report upon the Occurrence of Hydrocyanic Acid in the Grasses of Bechuanaland	M. Henrici	11th and 12th Report of D.V.E.&R. Union of S.A., '26.
[6]	Wilting and Osmotic Phenomena of Grasses and Other Plants under Arid Conditions	M. Henrici	Ditto.
[8]	A Descriptive Catalogue of some of the Common Trees and Woody Shrubs of Kenya Colony	E. Battiscombe	Crown Agents for the Colonies. 1927.
[9]	Poisonous Plants of South Africa. I.—Tulp	S. M. Stent & H. H. Curson	Govt. Printing & Stationery Office, Pretoria, 1922.
[17]	Veterinary Pathology...	A. T. Kingsley	Chicago. 1917.

(To be continued.)

carried out by the County Veterinary Inspector, accompanied by the veterinary and medical representatives of the consuming city. No further case of clinical tuberculosis was discovered, the conclusion being, therefore, that the offending animal had already been dealt with. Further samples of milk were taken, however, from every individual cow in milk for further investigation, and tubes containing suitable medium for the growth of diphtheria bacilli were inoculated by sterile swabs being rubbed on the "freshest" of ulcerated teat surfaces.

It is most interesting to note that of six such tubes inoculated, the diphtheria bacilli grew positively in two, one of which produced a pure culture of diphtheria and also proved fatal upon guinea-pig inoculation.

. . . . . .

From literature* perused upon the subject, it appears that previous identical cases to this have been observed. The observers are of the opinion that it is invariably a super-imposed infection of diphtheria upon the ulcerated surface of the teat—the infection being brought in from some outside source and the ulcerated teat surface forming a suitable medium for the maintenance of the bacilli.

. . . . . .

I consider it of prime importance to the veterinary profession that it should keep itself aware of the fact that where and when diphtheria is prevalent such ulcerations of teats are capable of being infected with these germs, and that the milking of such cows may infect the milk, so that the profession may prove herself of value in safeguarding public health and usefully co-operate with her sister profession to that end.

I am also of opinion that this is a coincidence of infection proclaiming the dire need that exists for the general routine inspection, by qualified veterinary surgeons, of all dairy cattle throughout the country.

A Case of Sassafras Poisoning in a Kitten.

By T. F. Prime, M.R.C.V.S., Upper Norwood.

Late on a Sunday night, a four-months-old kitten was brought to the surgery in a more or less comatose condition, the owner having, on the advice of a chemist, rubbed in its back, to kill fleas, three penny-worth of sassafras oil.

The owner, before applying the oil, went twice to the chemist to be certain that it was not poisonous, and did not use it on the Persian kitten till the chemist had again said it was harmless. The kitten's coat was rubbed with the oil late on the Saturday night and on Sunday morning the kitten was found to be ill and sleepy, which the chemist said was due to something it had eaten, and not to the oil. During the day it became more or less comatose and when I lifted the kitten up it was limp, the eyes were half closed, and it moved its forelegs in a sleepy, slow, deliberate way. The kitten gradually became more and more comatose, and quietly passed away a few hours later. There was no sickness or diarrhœa.

One always should be careful when using oil of sassafras, and I have seen cases where it has been rubbed into the ears of a long-haired dog, and left on, in which it has acted as an irritant and brought the hair off. When using this oil one should only apply it to parts where an animal cannot lick it off, and after a few hours wash the part with soap and water to remove the oil.

* "Milk and the Public Health," Dr. Savage.

REPORT.

Slippery Roads.

Extracts from Report of Investigations by The Slippery Roads Committee appointed by The National Horse Association of Great Britain.

A Deputation inaugurated by the National Horse Association, and headed by Sir Walter Gilbey, waited upon the Minister of Transport on the 23rd July, 1928.

The object of the deputation, which comprised delegates from thirty-six Societies, was to report that it is the unanimous feeling of all Societies interested in the use of roads by horses, livestock and motors that the majority of present-day roads are dangerous and slippery to all forms of transport.

With a view to finding some practical solution of this difficulty the Slippery Roads Committee was inaugurated by the National Horse Association, with instructions to discover the best possible non-slip surface.

This Committee after obtaining extensive data and information from all parts of the country as to what roads had proved satisfactory, had made personal inspection and experiments as to the capabilities of the recommended roads.

The Committee submitted a Report of their investigations and recommended three processes for first-class roads with heavy traffic, and general advice as to the treatment of second-class and other roads.

The Deputation invited the approval of the Minister of Transport to the report, as they felt that these recommendations, if issued with the approval of the Ministry of Transport, would receive the careful consideration of all county, local and district surveyors.

The Deputation also invited the Minister to use his best endeavours to induce surveyors to give a thorough test.

The Deputation informed the Minister that the Slippery Roads Committee would remain in being and would continue its investigation and experiments.

In replying, Mr. Piggott (Assistant Secretary, Roads Department) informed the deputation of the Minister's close personal interest in this question and of his sympathy with the objects which they wished to attain. The question had received, and would continue to receive, close attention on the part of the officers of the Department. The Minister was grateful for the information furnished in the Report submitted by the Deputation and would be glad to receive any further Reports.

Colonel Bressey (Chief Engineer, Ministry of Transport) then outlined some of the steps which were being taken by the Ministry to investigate the relative slipperiness of various forms of road surface, and to secure the adoption by highway authorities of methods which would produce roads suitable for use by all forms of traffic.

Mr. J. W. McIntosh and Mr. W. Perryman represented the National Veterinary Medical Association and Central Veterinary Society, respectively.

Members of the Slippery Roads Committee.

Chairman—Mr. Cecil G. Argles.

Sir Walter Gilbey, Bart.	*Ex-officio*
Capt. J. Bailward	*Hunter Society*
Col. F. Barker	*National Horse Association*

Mr. F. L. Birch ... ... *Thoroughbred Breeders'*
Mr. Nigel C. Colman, M.P. ... ... *Hackney Society*
Mr. W. J. Cumber ... ... *Shire Society*
Mr. F. W. Griffin ... ... *Shire Society*
Mr. R. S. Tilling ... ... *Transport Firms*
Sir Archibald Weigall, K.C.M.G. *National Pony Society*
Mr. A. B. Charlton ... ... *Shire and Hunter*
Secretary: R. A. Brown.

REPORT OF THE SLIPPERY ROADS COMMITTEE.

After having travelled some 1,000 miles inspecting and experimenting as to the non-slippery surface of recommended roads, the Chairman and Members of the Slippery Roads Committee now beg to report as follows:—

FIRST CLASS ROADS (Heavy Traffic). There appear to be three methods of construction which come as near to perfection as anything that has, up to now, been evolved:—

(1) *Gravel Mastic Surface*, as laid by the Associated Asphalt Company for the Huntingdonshire County Council, on several lengths of road in their County.

These have in some cases been down for five years, and despite the fact that they have never been treated in any way since they were laid, and that they provide a perfect surface for motor traffic, the evidence of owners of horse-drawn vehicles, taken on the spot, goes to show that they are entirely satisfactory for this type of traffic.

The cost of laying this surface is about 6s. per yard super, but varies slightly according to the district.

(2) *An Improved Patent Granite or Whinstone Macadam* known as "*Carpave*," manufactured by Messrs. Baldry, Yerburgh and Hutchinson (Roads) Ltd.

The method is to heat the stone to 180° F., then cool it to 80° F., at which temperature it is mixed with a bituminuous matrix, which is the firm's secret; after which it is applied when cold about 2½in. thick in two grades, and on a foundation of waterbound or tar macadam, and rolled down with a roller.

Lengths of this type of road were inspected in London, Surrey and Northumberland, all of which are very highly spoken of by horse owners.

Two lengths were examined on the outskirts of Newcastle—one had been down over eighteen months, carrying some 6,000 tons per day, while the other had been laid on the day of inspection. The fact that there was hardly *any* difference in the surface of the two sections, and that the former showed no signs of becoming slippery, is a powerful recommendation of itself.

The aggregate used in both cases was exceptionally hard local Whinstone, and the cost of surfacing worked out at 6s. 1d. per yard super.

From the motorists' point of view also the surface was a perfect one, and absolutely free from waves or depressions of any kind.

Despite the fact that the "Carpave" roads have been down only a comparatively short time, we feel that the above method of construction can be recommended with every confidence.

(3) *Dammann Asphalt*. Manufactured by the Dammann Asphalt Co. (Gt. Britain) Ltd.

The inventor of this material set out to devise a non-rigid road, and obtained his results by coating slag free from vitreous matter or hard limestone dust, with a minimum quantity of bitumen at a low temperature.

The manufactured article is 95 per cent. pure stone diluted with only 5 per cent. bitumen, which acts as a lubricant only. The result is very satisfactory both from the point of view of being non-slippery and also on account of its cushioning effect, reducing very materially the jar on horses' legs and feet.

While the road looks very much like any other asphalt, the fact that a horse's shoe leaves a distinct impression on the surface is the reason for its being non-slippery.

Arrangements are now being made for its manufacture in many parts of the country, and the fact that it can be carried any distance after manufacture without deterioration, and that it can be laid cold without any special plant beyond a light roller, makes it available at almost any point.

With regard to the cost, this varies from 3s. to 5s. 6d. per super yard laid according to thickness.

The Committee have inspected various roads laid with this material, and one in a busy London street carrying 35,000 tons of traffic daily, and find the surface satisfactory after eighteen months of wear. The Committee are informed that there are roads in Germany which were laid with this material from 7 to 10 years ago, since when they have received no treatment of any kind.

SECOND CLASS ROADS (Ordinary Traffic). In the case of these roads an expensive form of surfacing is, of course, out of the question, and it therefore becomes necessary to find something cheaper than the aforementioned.

We therefore recommend that a foundation of tar macadam costing from 3s. 6d. to 5s. per yard super, *or* a waterbound macadam at 2s. to 2s. 6d. per yard super be employed, this being sprayed annually, or once in two years (according to the amount of traffic to be carried) with any of the first-class proprietary compounds at the rate of 1 gallon to from 4 to 6 yards super, according to requirements on the old surface, containing from 20 to 40 per cent. of bitumen and 60 to 80 per cent. dehydrated tar; the larger the grit used the greater must be the percentage of bitumen. This being covered at the rate of a ton to every 100 to 120 yards super with clean ¾in. quartzite, gravel or granite (the two first-named for choice) rolled in immediately after application.

OTHER ROADS. In the case of other roads where the motor traffic is very slight and some surface treatment has been found necessary, spraying and gritting once in two to five years has been found sufficient. Under these conditions the cost works out at only 2½d. to 1d. per yard per annum.

Another surface was inspected in Huntingdonshire which was considered thoroughly satisfactory for country roads where there is no excessive motor traffic. This consisted of a layer of hard stone of 2½in. gauge spread evenly over the surface, grouted at the rate of 1½ gallons of matrix to the super yard, and then rolled in. This requires spraying and gritting, as before recommended, periodically, and it certainly provides the most perfect possible foothold for horses.

The question of CONCRETE ROADS has also been explored, but from the evidence which has been collected we are unable to recommend them. We find that after about two years it becomes necessary to spray or coat them, the result being that one can only treat the concrete as a foundation. As such it is too expensive as compared with a macadam one.

CAMBER. We further consider that the question of camber is a most important one, and recommend that there should be *no more than 3in. rise from the gutter to the centre of a 20ft. road*. This has been found ample for drainage.

FINALLY. We are unanimously of the opinion that the only way, in the case of roads which have to be treated periodically by spraying to obtain a satisfactory surface is to employ nothing less than ¾in. grit, which must be of a hard nature, on top of the proprietary compounds mentioned above. (It is probable that ⅞in. would be even better, but we have not seen this used.)

Grit of a soft or dusty nature, such as slag, has a tendency to become pulverized to such an extent as to mix with the tar compound, this produces a glazed surface; for this reason also the use of sand should be specially avoided.

ARMY VETERINARY SERVICE.

LONDON GAZETTE. WAR OFFICE. TERRITORIAL ARMY.

Nov. 2—Lt. F. J. Eardley to be Capt. (July 10); Lt. A. Fowler to be Capt. (Sept. 7).

ABSTRACTS.

[Proceedings of the Disease Section, Third World's Poultry Congress. (In *Report of World's Poultry Congress*, Ottawa, Can., 1927. Ottawa: Mortimer Co. (1928), pp. 255-380, figs. 48.]

Papers on avian pathology presented at the meetings held in Ottawa from July 27th to August 4th are as follows:—

New Developments of the Control of Poultry Diseases in the United States of America, by J. R. Beach (pp. 255-261); Combating Poultry Diseases by the State Serum Institute: Data from Six Thousand Autopsies, by B. J. C. te Hennepe (pp. 261-269); Preventable Losses from Poultry Diseases, by D. C. Matheson (pp. 270-272); The Action of the State in the Fight against the Communicable Diseases of Poultry (pp. 272-275); A Recapitulation of the Most Important Treatises on Poultry Diseases published in Germany in 1925-1926, by F. Schmidt (pp. 275-277); National and International Control of Poultry Diseases, by J. R. Mohler (pp. 278-281); Fowl Paralysis (Neuro-lymphomatosis Gallinarum), by A. M. Pappenheimer and L. C. Dunn (pp. 282-285); Entero-hepatitis in Turkeys and its Transmission through the agency of *Hetarakis (esicularis*, by E. E. Tyzzer (pp. 286-290); Diphtheria and Pox in Chickens and the Combating of this Disease, by L. de Blieck (pp. 290-294); Infectious Hepatic Enteritis of Young Turkeys, by N. Tortorelli (pp. 294-296); Experimental Studies on Avian Diphtheria, by N. Nakamura (pp. 297-300); A Few Facts regarding Roup, by C. H. Weaver (pp. 300-205); A Disease of the Wattles of Fowls due to Infection with a Strain of the Fowl Cholera Organism of apparently Low Virulence, by J. E. Thomas (pp. 306-308); Leucæmia and Pseudoleucæmia in Fowls, by P. Stazzi (pp. 308-310); Avian Typhus and Avian Cholera in Italy, by G. Finzi (pp. 310-313); An Experimental Study on the Virus of Fowl Pest on the Susceptibility of the Pigeon, by N. Nakamura and Y. Kawamura (pp. 313-316), The Use of the Bacteriophagum "Lactozym alfa Mezzadroli" in the Treatment of Diarrhœa and Enteritis (Colibacillosis) in Chickens, by G. Mezzadroli (pp. 361-368); Septicæmia of Ducks, by F. R. Beaudette (pp. 318-321); Fowl Spirochætosis, by H. Cooper (pp. 321, 322); Fowl Typhoid in South Africa, by G. Martinaglia (pp. 322-326); Coccidiosis of Chickens—Its Outbreak in the Argentine, by S. S. Quiroga and R. Scasso (pp. 326-332); Some Intestinal Worms of Chickens and their Control, by J. E. Ackert (pp. 333-355); The Use of Nicotine Sulphate in the Control of the Intestinal Roundworm, by S. B. Freeborn (pp. 336-339); On the Life History of the Chicken Nematode, *Ascaridia perspicillum*, by S. Itagaki (pp. 339-344); Physical Study, Economic Value of Birds, Transmission to Progeny, and the Influence of Males and Females in the Transmission of Bacillary White Diarrhœa, by B. F. Kaupp and R. S. Dearstyne (pp. 345-352); Fowl Typhoid and Fowl Cholera, by L. D. Bushnell (pp. 353-355); The Agglutination Test as applied to the Control of Bacillary White Diarrhœa, by C. P. Fitch and R. E. Lubbehusen (pp. 356-360); The Importance of the Dilution Factor in the Agglutination Test for Bacillary White Diarrhœa, by G. Gwatkin (pp. 360-364); Bacillary White Diarrhœa of Chicks, State-wide R. E. Jones (pp. 364-369); Sanitary Regulations in the Control of Bacillary White Diarrhœa, by F. A. Laird (pp. 369-371); The Incubator as a means of Transmitting Bacillary White Diarrhœa, by W. R. Hinshaw (pp. 372-374); Bacillary White Diarrhœa in Belgium, by Leynen (pp. 374-377); and Investigation of Diarrhœa in Young Chicks in Japan, by N. Nakamura (pp. 377-380).

[Iodine and Some New Solvents for Skin Antisepsis. R. A. Macdonald and J. Wicliffe Peck (*Lancet*, 5, 479, 443, 1928.)]

With the exception of rectified spirit, no other solvent for iodine has hitherto been found suitable. Any new solvent must be antiseptic in itself, have penetrative powers when applied, should not be harmful to the skin; be stable; and evaporate readily when applied. The authors have experimented with ether, petroleum ether, diacetone, alcohol, sextol, isopropyl alcohol, and E.G.E.E. (made from ethylene obtained by "cracking" petroleum oils) From bacteriological and other tests the authors conclude that (1) iodine in the strength of 1·25 per cent. is, in itself, an efficient antiseptic; (2) isopropyl alcohol is the most antiseptic of the solvents used; (3) iodine in 1·25 per cent. in isopropyl alcohol is not harmful to the skin; (4) its penetrative powers and evaporation rate are equal to ethyl alcohol; and (5) its cost is very much less than that of rectified spirit. They therefore recommend 1·25 per cent. iodine in isopropyl alcohol as a substitute for the commonly used iodine in rectified spirit.—*Pharmaceutical Journal.*

Bacillus botulinus in Scottish Soils.

G. Leighton and J. B. Buxton (*Journ. of Hygiene*, August 8th, 1928, p. 79) report the results of the examination of 100 samples of soil taken from different Scottish counties with a view to determining the presence of *B. botulinus*. The series yielded only 4 per cent. of positive results, as compared with 5·5 per cent, in Denmark, 7·8 per cent. in England, 20 per cent. in Holland, and 23·5 per cent. in Switzerland. The authors remark, however, that it would not be safe to conclude that the organism is relatively and proportionately rare in Scotland; what is definitely shown for the first time is that both the A and B types of *B. botulinus* occur in Scottish soil. Only eight samples of soil gave filtrates containing tetanus toxin; four of these came from manured cultivated land—one from old pasture and one from moorland—Two soils yielded the A type of *B. botulinus*, this being the first time that it has been found in a European soil. The authors mention that the investigation owes its inception in part to the Loch Maree tragedy in 1922, particulars of which were given in the *Journal* of February 17th, 1923 (p. 279), by T. K. Munro and W. W. N. Knox.—*British Medical Journal.*

H.M. Stationery Office Publications.

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses:—London: Adastral House, Kingsway, W.C.2, and 28 Abingdon Street, S.W.1; Cardiff: 1 St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120 George Street

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Synthetic Milk.

The question of synthetic milk and cream was discussed at a meeting of the British Dairy Farmers' Association, recently, at the Royal Agricultural Hall, Islington.

A Devonshire member asked what could be done with regard to synthetic cream. Some action, he said, should be taken so that it might be known as synthetic.

Lord Bledisloe pointed out that the question applied to milk as well as cream. "On several long-distance ocean liners to-day," Lord Bledisloe declared," there is quite a palatable substitute for milk being provided for the passengers under the name of milk. It is made by a machine called an emulsifier from Argentine butter and New Zealand milk powder.

"A product that comes from the combined effort of cows in the Argentine and New Zealand and a machine ought not to be retailed as dairy milk."

Victoria Veterinary Benevolent Fund.

Meeting of Council.

A meeting of the Council of the Victoria Veterinary Benevolent Fund was held at 10 Red Lion Square, London, W.C.1, on Wednesday, October 17th, 1928, when the following members were present:—Mr. S. H. Slocock (Vice-President), in the Chair, Mr. J. W. McIntosh, Mr. G. P. Male, Lt.-Col. P. J. Simpson, Capt. S. Villar, Mr. E. Alfred West, Mr. J. Willett, and Professor G. H. Wooldridge.

Apologies for absence were received from Messrs. H. J. Dawes, F. L. Gooch, J. Ewing Johnston, C. W. Townsend, and W. J. Young.

The minutes of the previous meeting, having been published, were taken as read and signed as correct.

Correspondence. (1) From Mr. William Roots, sending a donation of £10 as a thank-offering in commemoration of his golden wedding.

It was resolved that the best thanks of the Council be addressed to Mr. Roots, with congratulations and good wishes for his continued good health.

(2) From Mr. Arnold Spicer, sending a further donation of £35 for investment.

It was resolved that the grateful thanks of the Council be addressed to Mr. Spicer for his very generous donation and for his continued interest in the prosperity of the Fund.

(3) From Mr. A. Whicher, enclosing £2 for distribution in equal amounts to Cases Nos. 122 and 120, and also making useful suggestions with regard to the use of collecting boxes.

It was resolved that the best thanks of the Council be conveyed to Mr. Whicher for his generosity and for his practical suggestions about collecting boxes.

Secretary's Report. The Secretary reported that since the previous quarterly meeting the following donations had been received:—

Arnold Spicer	£35	0	0
W. Roots	10	0	0
L. S. Balls	1	5	0
C. O. Langley	1	1	0
S. H. L. Woods	0	11	6
Mrs. Stuart	0	10	6
Western Counties V.M.A. ...	2	7	6
N.V.M.A. (Collecting Box) ...	1	4	9
	£52	0	3

Cases.—

No. 122, Widow, age 33, 2 young children. No income. The grant of 20s. weekly was continued.

No. 114, Member, aged 66. Now in mental hospital. It was resolved that the grant be discontinued.

No. 84, Widow, aged 46, 4 children under 16. Lets apartments. The grant of 5s. per week was continued.

No. 41, Widow, aged 72. Receives old age pension and £1 per month from daughter. It was resolved that the grant of 10s. weekly be continued for the present quarter, but that the Secretary be instructed to inform the qualified son of this recipient that, as the Council cannot continue the grant to his mother, they look to him to take over the responsibility.

No. 62, Widow, aged 67, 4 adult children. It was resolved that the grant of 10s. per week be reduced to 7s. 6d. per week.

No. 120, Widow, aged 27, 4 children under 6. No income. It was resolved that the grant of 20s. per week be continued.

No. 53, Widow, aged 44, 6 children, 3 at school. It was resolved that the grant of 20s. per week be continued.

No. 89, Widow, aged 54, 2 children, one at school. A report by the Secretary was received in this case, and it was resolved that the grant be reduced to 15s. per week, during the present quarter, and that the recipient be recommended to obtain employment for her son, now aged 15.

No. 14, Widow, aged 72, 5 adult children, none able to help. Old age pension. It was resolved that the grant of 10s. weekly be continued.

No. 43, Widow, aged 67, 5 adult children. It was resolved that the grant of 10s. weekly be continued, but that further enquiries be made into the circumstances of this case.

No. 47, Member, aged 68, no children. It was reported that this member had been removed to the Infirmary and that the grant was no longer needed. An application was made for a special grant towards debts incurred on behalf of the recipient, and it was resolved that a grant of £2 be made.

No. 115, Member, aged 63, unemployed, no means. It was resolved that the grant of £1 be continued for the present at the discretion of the Executive Committee, but that steps be taken to advertise in the *Veterinary Record* for suitable employment.

No. 19, Widow, aged 66, 2 adult children. Lets apartments. It was resolved that the grant of 10s. weekly be continued.

No. 109, Widow, aged 40, 3 children all now at work. A report on this case was submitted by the President, and it was resolved that the grant be reduced to 10s. per week during the present quarter.

No. 123, Widow, aged 52, one daughter at school. Lets furnished rooms. Application for temporary loan. It was resolved that the application be not acceded to.

No. 124, Widow, aged 79, receives old age pension. No other income. It was resolved that a grant of 10s. weekly be made.

No. 125, Member, aged 74, receives old age pension. It was resolved that a grant of 10s. weekly be made.

No. 126, Widow, aged 50, no children. It was resolved that no grant be made.

Personal.

Appointment. Mr. William A. R. Ogilvie, M.R.C.V.S., has been appointed meat inspector by the Turriff Town Council.

An announcement of interest to all veterinary users of the microscope appears on Advt., page IX.

DIVISIONAL REPORT.

Scottish Metropolitan Division.*

A meeting of the Scottish Metropolitan Division of the National Medical Association of Great Britain was held in the Royal (Dick) Veterinary College, Edinburgh, on Wednesday, 20th, June, 1928—Professor R. G. Linton, President, occupying the chair. The following gentlemen signed the attendance book:—*Members*, Professor R. G. Linton, President; Messrs. J. Aitken, S. Robson, A. Gofton, J. Ker; Professors Wm. M. Mitchell and J. Russell Greig, Messrs. A. B. Kerr, J. N. Ritchie, J. Sommerville, P. Fisher, Geo. F. Boddie, W. S. Lornie, Professor D. C. Matheson, Messrs. J. P. Walker, J. F. Player, J. McGregor, H. M. Wilson, J. R. Baillie, R. H. Connochie, J. Taylor, Dr. O. Charnock Bradley, W. Wallace Peggie and the Hon. Secretary.

Visitors.—Messrs. A. P. Hamilton, G. Johnson, J. Lauder, C. A. P. Buckner, C. M. Davidson, W. M. Mackay, A. Malaga, Dr. A. Calder, Edinburgh; Professor J. F. Mackenzie, Columbia, Ma., U.S.A., Professor F. B. Hutt, Minnesota, U.S.A., Messrs. P. Snodgrass, A. Sillars, W. E. Armstrong (Wigton, Cumberland), Baillie, Dr. T. G. Nasmyth, Edinburgh; Mr. J. R. C. Smith, Mowhaugh, Kelso; Mr. R. A. S. Macdonald, Livingstone, Central Africa; Messrs. R. S. Marshall, A. P. Blount, Dr. H. Dryerre, Messrs. C. V. Watkins, W. Scott, J. Yule Bogue, D. F. Macpherson, S. Simpson, S. Grassovsky, D. Kennedy, W. S. Cartwright, J. C. Naylor, D. Canning, J. S. Watt, A. J. Baxter, J. P. McNally, J. J. Magowan, R. Moore, and J. McKellar. The total number present was sixty.

After the meeting of Council, which was held at 2 p.m., Dr. A. Savage, B.Sc.A., D.V.M., of Winnipeg, Canada, read a paper entitled, "Impaired Fertility in the Male: Its Importance and Detection," the paper being illustrated by lantern slides.

[This paper, together with the discussion which followed, is reproduced at the commencement of this issue of the *Record*.—ED.].

Prior to the reading of his paper by Dr. Savage, the minutes of the last meeting, which had been published in the *Veterinary Record*, were approved and signed by the President.

The Secretary than intimated apologies of absence from Mr. McIntosh, Mr. Falconer Wallace, Dr. A. W. Whitehouse, Mr. J. Brown, Mr. E. J. H. Sewell, Mr. D. McKail and Major Baird.

Victoria Veterinary Benevolent Fund.—As the annual contribution to the Victoria Veterinary Benevolent Fund had been overlooked the previous year, it was unanimously resolved to grant a donation of two guineas for both the present year and the previous year.

Mr. GOFTON made an appeal to all those present to become personal contributors to the fund, and said that when one sat and listened to the rather lamentable and appalling cases one could not but feel touched with sympathy for those who were in distress, and he was certain that those who contributed personally to the fund were contributing to a very excellent and deserving cause.

* Received on 12th October, 1928.

Obituary.—The CHAIRMAN referred in suitable terms to the death of Mr. Robert Reid, of Cupar, and the meeting signified their sympathy in the usual manner.

Election of New Members. The following gentlemen, having been duly nominated at the last meeting were elected to membership:—Mr. J. W. Ritchie, Veterinary Department, City of Edinburgh; Mr. T. S. Skinner, Kirkcaldy; Mr. J. D. Ferguson, Crieff.

Nomination.—Professor Mitchell intimated that he wished to nominate Mr. George Jamieson, of Haddington, as a member.

The CHAIRMAN, in introducing Dr. Savage, said that the subject with which he was going to deal was one of great importance to the stock breeder and of intriguing interest to their profession. He thought they were very fortunate in having obtained the consent of Dr. Savage to give them first-hand information of the result of some of his researches. (Applause).

All present heard Dr. Savage's paper with great interest, and a large number participated in the discussion. Following the essayist's reply, The CHAIRMAN, in moving a hearty vote of thanks to Dr. Savage, said that during all the years he had been a member of the Division he had never attended a meeting which had given him greater satisfaction nor had he heard a paper which had caused greater interest than that they had that afternoon. (Applause.)

After a vote of thanks to the Chairman the meeting terminated.

W. C. MILLER, *Hon. Secretary.*

Glasgow Veterinary College.

A MEETING IN AID.

(*Contributed.*)

A public meeting in support of the maintenance of Glasgow Veterinary College was held in the Merchants' Hall, 30 George Square, Glasgow, on Friday, 19th October, the Lord Provost of Glasgow, Sir David Mason, presiding. The College has been in financial difficulties for some years, having fallen a victim to the Government's policy of economising at the expense of institutions in the West of Scotland.

Lord Provost MASON said that the meeting was a corollary to that held in the same hall in 1925 to protest against the withdrawal of Government grants to the College. There were many arguments why they should support the College, but he would mention two only. The College was the only institution of its kind in the West of Scotland, and it had sent into the veterinary profession some of its most famous men. As a teaching institution it had a splendid record of success.

Professor JOHN GLAISTER, Professor of Forensic Medicine in Glasgow University and Chairman of the Board of Governors of the College, briefly reviewed its history during the last 65 years. He compared the sum of £71,400 granted to the Royal (Dick) College by the Government with that of £15,600 granted to the Glasgow College, and showed that there was no such disparity in the relative enrolment of students even before the grant was withdrawn. As instances of the high academic standing of Glasgow students he referred to the last two Fitzwygram winners, and the Development Commission research scholarships, both won this year by Glasgow graduates. Most of these successful students, he said, attended College while living at home, and could not afford to study at any other centre.

THE DUKE OF MONTROSE, K.T., hon. president of the College, said it would be a thousand pities if the College were to fade away for want of financial support. The Government had advised those engaged in farming to take

up animal husbandry, hence the need for an up-to-date veterinary service made their action in withdrawing the grant incomprehensible. There were 3,000,000 head of livestock in the area served by the College, and it was the home of excellent breeds—Clydesdale horses, Ayrshire, and Galloway cattle. With the appalling losses caused by anthrax, foot-and-mouth disease, brazy, fluke and swine fever, a well-supported veterinary college was a necessity.

Sir ROBERT WILSON, Chairman of the Glasgow Education Authority, moved the following resolution :—

"That this public meeting, consisting of representatives of public authorities, associations and institutions, and of private citizens of Glasgow, and the West of Scotland, pledges itself to support the efforts of the Governors to secure the continuance of Glasgow Veterinary College and strongly recommends the Governors' appeal for funds to all public bodies and citizens of Glasgow and the West of Scotland, to landed proprietors, to stock rearers and owners, and to all lovers of animals."

Sir Robert Wilson said he had no patience with a Government that spent millions on battleships, and then refused a small sum to an institution like the College. It was better economy to protect public health by veterinary meat and milk inspection than to build hospitals. Out of an annual £600 given by Education Authorities, Glasgow Education Authority already gave £350, but he appealed to them all to do more. Under Section 9 of the Education Act the Authorities had very wide powers to support central institutions, and they already gave £1,500 to the School of Art to teach boys and girls to draw common objects ; how much better to turn out veterinary surgeons and so insure the public health. It would be a public scandal if the veterinary college had to close its doors.

Col. Sir GEORGE M. H. STIRLING, Bt. C.B.E., D.S.O., Glorat, Baldoran, Milton of Campsie, briefly seconded the resolution.

Dr. A. W. WHITEHOUSE, Principal of the College, appealed on the grounds that there were more opportunities in the veterinary profession than there were men to take advantage of them, and that students drawn from this part of Scotland became highly successful veterinary surgeons. Twenty-three Glasgow students had qualified in the past fifteen months. He detailed their careers, and showed that twenty-one of these were already well launched in their profession. He had no doubt that the remaining two would soon be placed. There was a real demand for Glasgow graduates.

Mr. ALEXANDER PARK, Ingleside, Lenzie, an old friend of Principal McCall and a Governor of the College since it was incorporated, pointed out that what was needed was a capital sum of £20,000 or an income of £1,000 a year. He suggested 100 donors of £200 each, of whom he undertook to be one.

Mr. ARCHD. MACNEILAGE, editor of *The Scottish Farmer*, speaking as a Governor and a member of Glasgow Education Authority, said that this was an S.O.S. meeting. They had done their best as Governors, and Dr. Whitehouse and his staff had done their best as teachers—with conspicuous success on their part—to further the interests of the College. None of them were millionaires, and they turned to those that had more of this world's goods to support a teaching institution that had brought credit to the city for nearly seventy years, and that had turned out a body of veterinary surgeons second to none. Glasgow was a fine clinical school, and Glasgow students had the reputation—he was speaking from the information of those in a position to know—of making splendid general practitioners. The question now before them was whether such an institution was to be closed down for lack of funds.

The CHAIRMAN intimated that since the meeting began he had received a message to the effect that the Duke and Duchess of Montrose would start the subscription fund with £100 if 100 others would do the same.

On the call of Major GOFF, Lainshaw, Stewarton, vice-president of the Glasgow Agricultural Society, the chairman was accorded a vote of thanks.

(*Continued at foot of next column.*)

NOTES AND NEWS.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

Nov. 12th—Meeting of the Editorial Committee N.V.M.A., 10 Gray's Inn Square, W.C.1, at 4-30 p.m.

Nov. 15th—N.V.M.A. Extraordinary General Meeting, Corporation Wharf, Holliday Street, Birmingham, 2-30 p.m.
Meeting of the Midland Counties Division N.V.M.A., Corporation Wharf, Holliday Street, Birmingham, 2 p.m.
Meeting of the Western Counties Division N.V.M.A., at Taunton.

Nov. 16th—Meeting of the North Wales Division at Wynnstay Hotel, Wrexham, 2 p.m.

Nov. 20th—"Dick" College Founder's Day, Address by President of the Royal College of Surgeons.

Nov. 21st—Annual Meeting of the Scottish Metropolitan Division N.V.M.A., at Edinburgh.

We would remind our readers that in connection with the Extraordinary General Meeting of the Association, which is to take place at Birmingham on the afternoon of Thursday, November 15th, a cordial invitation is issued to all those attending to participate in the meeting of the Midland Counties Division, which is being held at the same place on that afternoon. Particulars of both meetings will be found in our Notices columns.

COLONIAL VETERINARY SERVICES.

The attention of readers is directed to the fact that there are still several vacancies for Veterinary Officers in East Africa, particulars of which were given in an advertisement appearing in this journal for September 8th. The Colonial Veterinary Services will undoubtedly be expanded in the near future so that the present is a very opportune time for men of the right stamp to enter these services. Full particulars can be obtained on application to—

The Private Secretary (Appointments),
Colonial Office,
2 Richmond Terrace,
Whitehall,
London, S.W.1.

. . . . . .

The following appointments have been made by the Secretary of State for the Colonies during the month of October, 1928 :—

Name.	*Appointment.*	*Colony.*
Mr. D. F. Macpherson	Veterinary Officer	Kenya.
Mr. F. W. Aston, M.R.C.V.S. ...	Veterinary Officer	Kenya.
Mr. H. M. Salusbury, M.R.C.V.S.,D.V.H.	Veterinary Officer	Tanganyika Territory.

(*Continued from previous column.*)

NOTE. At the date of writing this report (Nov. 2nd) the Duke and Duchess of Montrose's fund amounts to nearly £700, and certain public bodies have intimated that they are likely substantially to increase their annual grants. Concerted work for a year ought to see the College out of the worst of its difficulties.

Veterinary Regulations and a Treaty.

"After more than 2½ years of negotiation a German-Lithuanian Trade and Shipping Treaty was signed in the Wilhelmstrasse yesterday to supersede the provisional Tariffs Agreement of 1923, which, being based on inflation conditions, was completely out of date," says *The Times* of November 1st.

"The treaty has a particular importance as the first concluded by Germany with one of her eastern agricultural neighbours. The conditions of negotiation with Poland and Lithuania have had many points of resemblance. In each case there has been stubborn bargaining over the import of meat and livestock into Germany, and in each case the actual settlement of contingents and tariffs has caused less difficulty than the German veterinary regulations, which both the Poles and the Lithuanians have asserted to be tantamount to import prohibitions if carried out under strong agrarian influence. This is another of those innumerable cases in which the Reich-Prussian dualism places obstacles in the way of straightforward settlements.

"The German-Lithuanian Treaty, so far as can be gathered, offers the Lithuanians a reasonable prospect of exporting meat and livestock to Germany, including the horses, which are an important item for them, and a compromise appears to have been reached on the veterinary question, which prevents the prospect from being illusory."

. . . . . .

We learn, that the Polish-German trade negotiations, on the other hand, which are now in their fourth year, are undergoing a "pause," the veterinary regulations again appearing to be the main cause of the trouble.

CORRESPONDENCE.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents

Making Horses Safe for Roads.

To the Editor of the Veterinary Record.

Sir,—Reports from the shires and provinces where hunting has now begun seem to show that it is no use waiting for the roads to be made safe for horses—though we shall continue to ask that everything possible be done in that direction—and that it is better, in the meantime, to turn our attention to making the horses safe for roads.

This is not as difficult as might be imagined from reading the unfortunate experiences people have had with various out-of-the-way types of shoes and pads. In all the recent discussions no one has mentioned a type of horseshoe pad which has been proved by the Institute of the Horse, as a result of a four months' test on cavalry horses, to be eminently suitable for hunting, hacking or draught purposes, on roads or cross-country. It is a rubber pad, backed by a flexible steel bridge on which the natural frog presses downward as the foot meets the ground, thus maintaining the healthy functioning of the whole foot.

Several well-known masters of hounds have used this flexible bridge continuously for the past few seasons and have been able to recommend it to those in difficulties. If this letter should meet the eye of anyone who is wondering if hunting is really worth while in these days of motoring roads, it will have served its purpose.

I should mention that a special type of non-slip shoe was placed second to the pad in the final result of our all-round tests on roads and grass and further information about the results is available for our members.—Yours faithfully, P. B. Sangster, Major-General, Secretary, Institute of the Horse.

27 Cavendish Square, London, W.1.
29th October, 1928.

Purpura Hæmorrhagica in Greyhounds.

To the Editor of The Veterinary Record.

Sir,—I have read with considerable interest Major Hamilton Kirk's paper on Canine and Feline Problems. It brought back pre-historic memories of my research days. With reference to so-called purpura hæmorrhagica in Greyhounds, Major Kirk advances the theory that a pasteurella is probably the causal agent, and I am inclined to think he is right, except that the course of the disease is hardly rapid enough for an acute septicæmia, which a bi-polar organism would most probably set up.

Way back in about 1908 Mr. Gaiger, now Professor Gaiger, noted that cattle fed on the pasteurella of hæmorrhagic septicæmia not only resisted infection, but acquired an immunity. Being in charge of the Muktesar Laboratory at the time, I worked at this subject, together with Dr. Hartley and Mr. Cross, and we demonstrated that if the stomach is normally *acid* the pasteurella could do no harm. If the stomach was rendered *alkaline* infection took place at once. Such a method of immunisation was, of course, not a practical one, as any injury to the buccal membrane caused by rough herbage, etc., led to infection. The pasteurellas lend themselves easily to the making of a vaccine for subcutaneous use, and such vaccines are usually efficacious.

It is of interest to note that Wallis Hoare, in his "Veterinary Medicine," suggests that a quinine mixture, which is of necessity acid, is most beneficial in the treatment of canine typhus and the distressing diarrhœa which is thought to be a sequel of distemper. I have found this of considerable benefit in treating my wife's Greyhounds, several of which have had so-called typhus or purpura. This seems to bear out Major Kirk's idea that a bi-polar organism is to blame.

I am afraid I have not followed the Mill Hill research work carefully, but it would be of interest to know if the stomach reaction of dogs in the primary or catarrhal stage of distemper is alkaline or only weakly acid. If this is so, the pasteurella may gain admission to the alimentary tract and set up the condition under discussion. It is a fact that the disease is not contagious in the ordinary sense, as I have had several of my wife's dogs—Bull terriers and Greyhounds—affected, and their kennel mates have not been attacked. There is no doubt that rats may convey it, but whether through the medium of the flea or by soiling the feed tins with infected excrement I do not know.

I have not noted the rat flea in any affected dogs. So far as I recollect, a full account of my feeding experiments with hæmorrhagic septicæmia of cattle appeared in the *Journal of Tropical Veterinary Science* in the year 1909 or 1910.

I am glad that Major Kirk has found Odylen of use in skin diseases of dogs. I can bear this out, for in a severe case of eczema in a Bull terrier which had resisted ultra violet ray and all ordinary dressings, Odylen *cum* Arycil cleared it up in three weeks.

I hope, Mr. Editor, you will pardon my verbosity, but my excuse is that Major Kirk has resurrected enthusiasm for some research work which I did long ago, and had forgotten, and of which probably the present generation has never heard.—I am, yours truly,

Kingwood, Lambourn, Berks. F. H. Baldrey, Lt.-Col.

The Editor acknowledges the receipt of the following:—

Communications from Dr. H. H. Curson (Pretoria), Prof. S. H. Gaiger (Liverpool), Mr. A. S. Leese (Stamford), Dr. F. C. Minett (London), and Mr. W. A. Pool (Edinburgh).